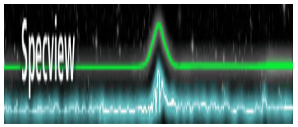
VOツール解説（３）
Specview



国立天文台・天文データセンター
小宮　悠

インストール

- http://www.stsci.edu/institute/software_hardware/specview/download
  - 解凍して、インストーラを実行
    - 必要に応じて
      specview_lines.jar、specview_standards.jar、
      specview_kurucz.jar　をダウンロード。

    - Windows: スタートメニューから起動
    - Mac: アプリケーションから
    - Unix: コマンドラインから

Specview

- 簡単なスペクトル処理
- VO上のスペクトルデータの検索・取得
- 標準星、理論モデルとの比較

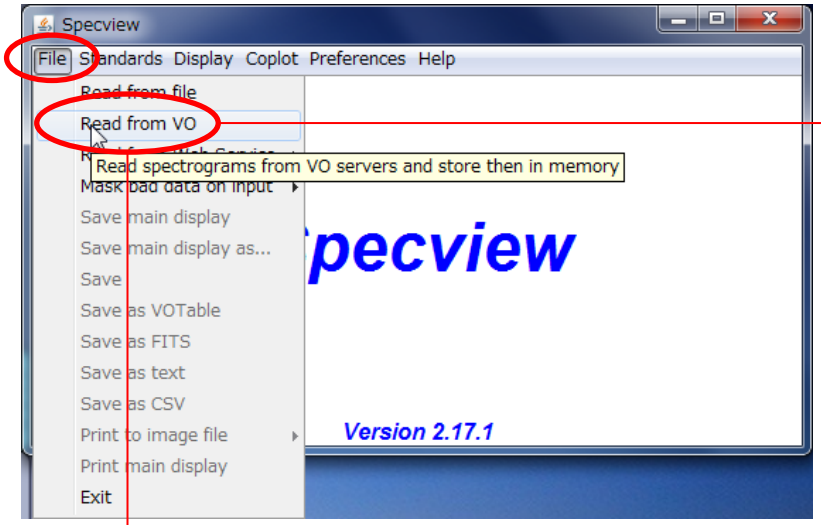
- Web site
  http://www.stsci.edu/institute/software_hardware/specview

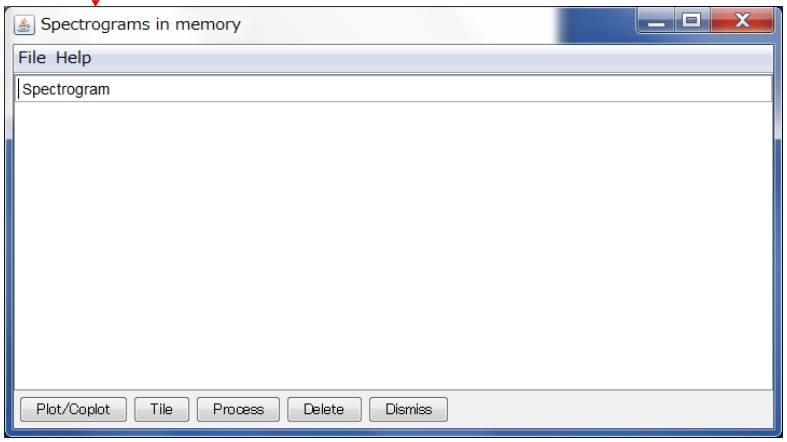
マニュアル

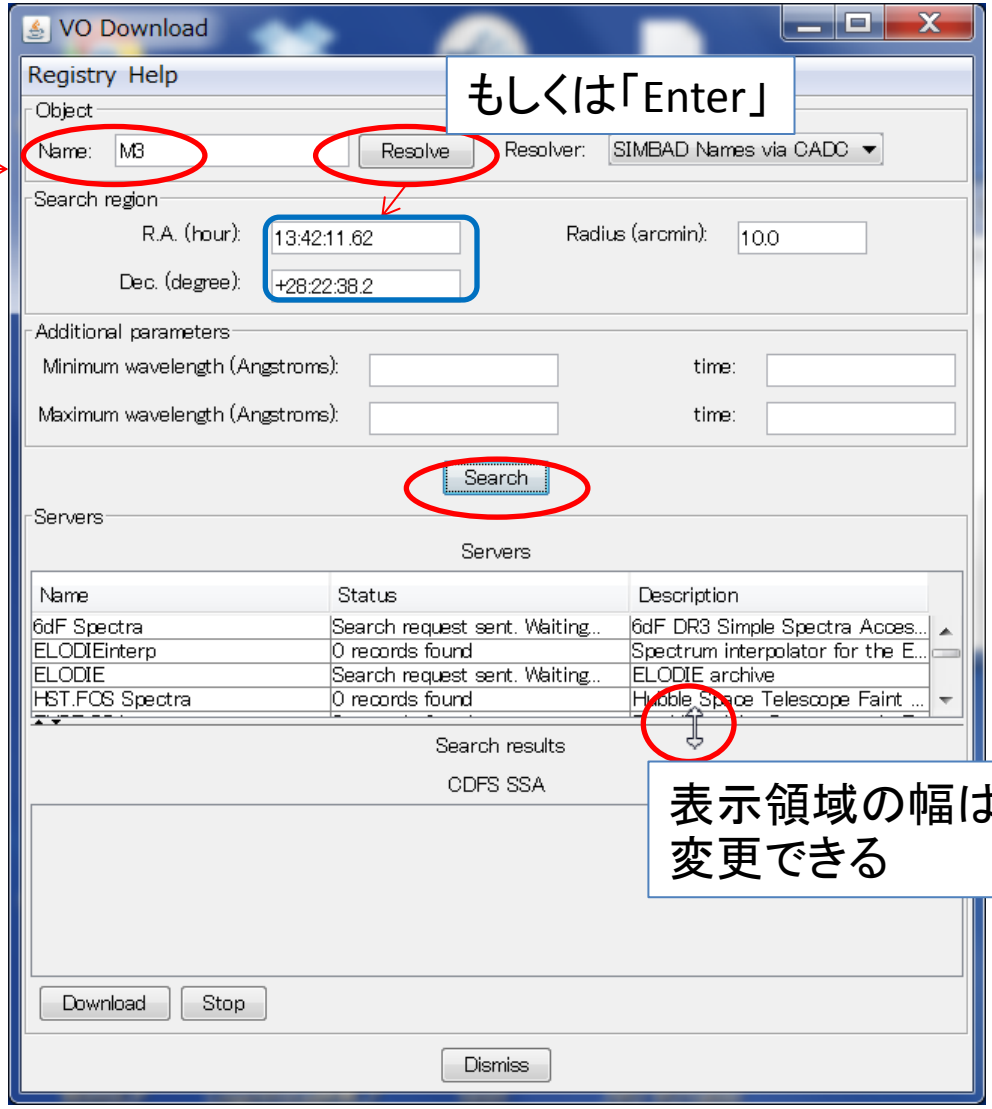
- http://www.stsci.edu/institute/software_hardware/specview/documentation
- 起動した window の「Help」ボタン

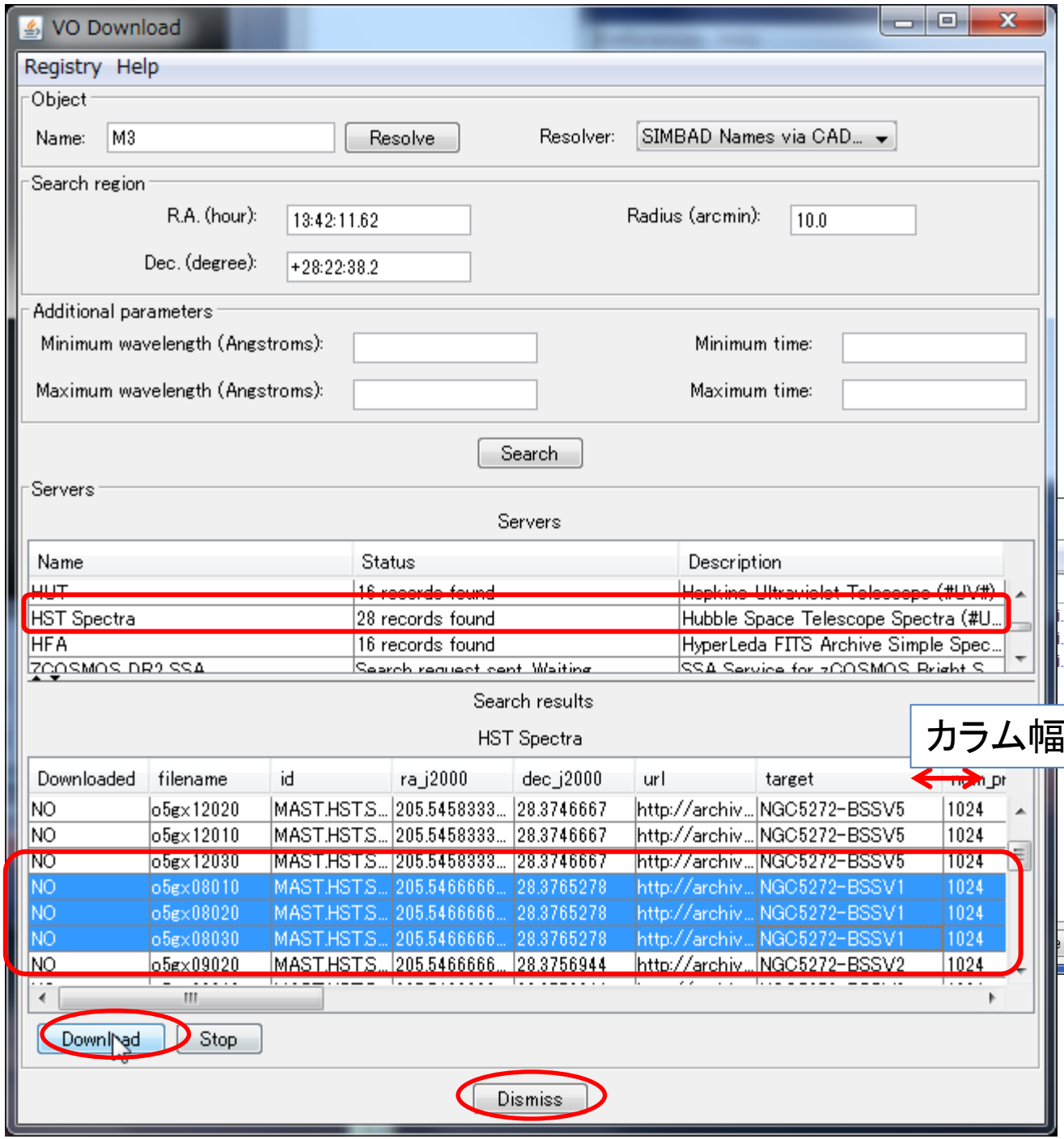
- チュートリアル
  - http://www.stsci.edu/institute/software_hardware/specview/tutorial
- スクリーンショット集
  - http://www.stsci.edu/institute/software_hardware/specview/examples

VO検索

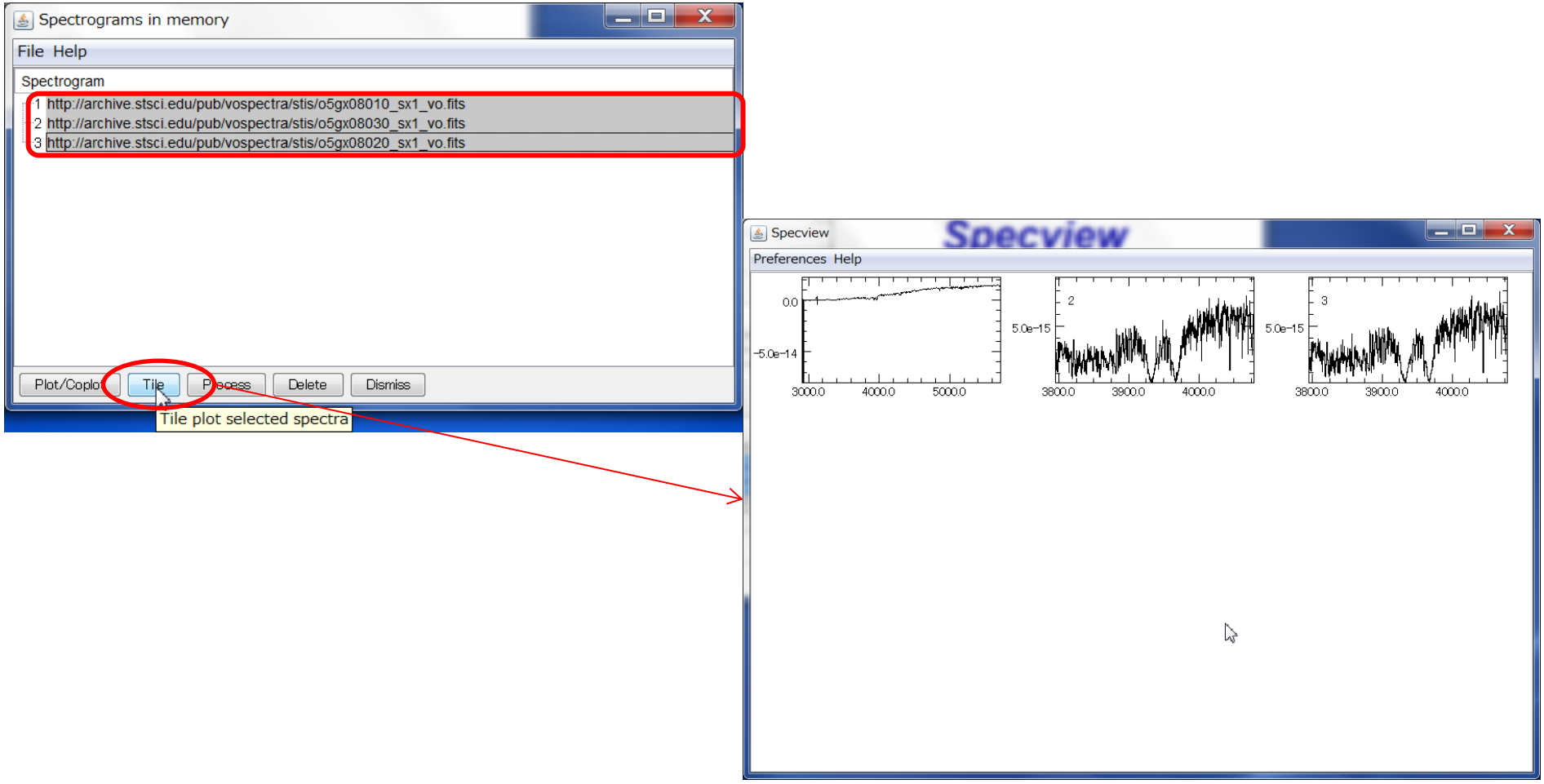

Specview
File Standards Display Coplot Preferences Help
Read from file
Read from VO
Read spectrograms from VO servers and store then in memory
Mask bad data on input
Save main display
Save main display as...
Save
Save as VOTable
Save as FITS
Save as text
Save as CSV
Print to image file
Print main display
Exit
pecview
Version 2.17.1


Spectrograms in memory
File Help
Spectrogram
Plot/Coplot
Tile
Process
Delete
Dismiss

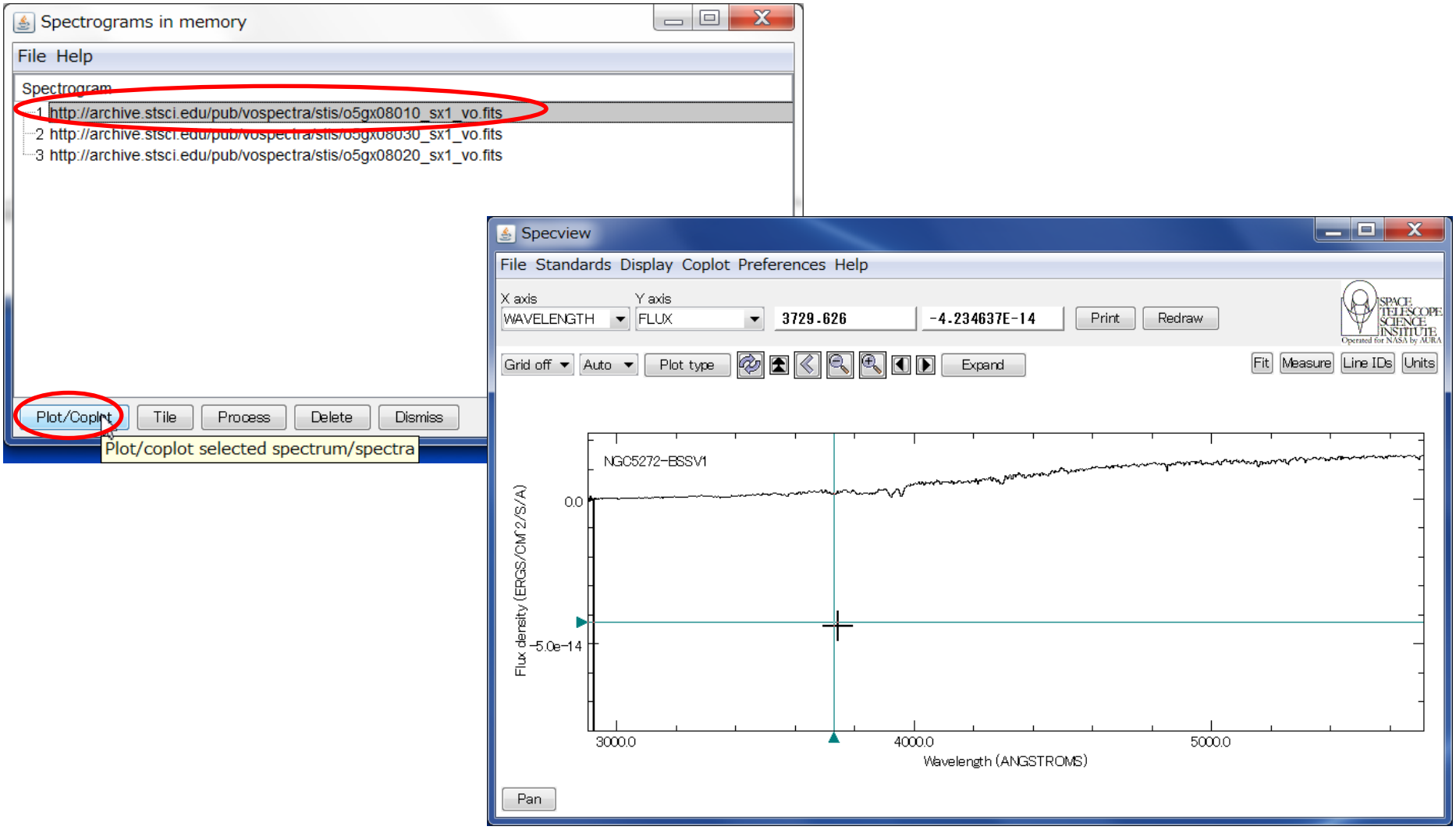

VO Download
Registry Help
もしくは「Enter」
Object
Name: M3
Resolve
Resolver: SIMBAD Names via CADC
Search region
R.A. (hour): 13:42:11.62
Dec. (degree): +28:22:38.2
Radius (arcmin): 10.0
Additional parameters
Minimum wavelength (Angstroms):
Maximum wavelength (Angstroms):
time:
time:
Search
Servers
Servers
Name
Status
Description
6dF Spectra
Search request sent. Waiting...
6dF DR3 Simple Spectra Acces...
ELODIEinterp
0 records found
Spectrum interpolator for the E...
ELODIE
Search request sent. Waiting...
ELODIE archive
HST.FOS Spectra
0 records found
Hubble Space Telescope Faint ...
Search results
CDFS SSA
表示領域の幅は
変更できる
Download
Stop
Dismiss


VO Download
Registry Help
Object
Name: M3
Resolve
Resolver: SIMBAD Names via CAD...
Search region
R.A. (hour): 13:42:11.62
Radius (arcmin): 10.0
Dec. (degree): +28:22:38.2
Additional parameters
Minimum wavelength (Angstroms):
Minimum time:
Maximum wavelength (Angstroms):
Maximum time:
Search
Servers
Servers
Name
Status
Description
HUT
16 records found
Hopkins Ultraviolet Telescope (#UV#)
HST Spectra
28 records found
Hubble Space Telescope Spectra (#U...
HFA
16 records found
HyperLeda FITS Archive Simple Spec...
ZCOSMOS DR2 SSA
Search request sent. Waiting
SSA Service for zCOSMOS Bright S
Search results
HST Spectra
Downloaded
filename
id
ra_j2000
dec_j2000
url
target
NO o5gx12020 MAST.HST.S... 205.5458333... 28.3746667 http://archiv... NGC5272-BSSV5 1024
NO o5gx12010 MAST.HST.S... 205.5458333... 28.3746667 http://archiv... NGC5272-BSSV5 1024
NO o5gx12030 MAST.HST.S... 205.5458333... 28.3746667 http://archiv... NGC5272-BSSV5 1024
NO o5gx08010 MAST.HST.S... 205.5466666... 28.3765278 http://archiv... NGC5272-BSSV1 1024
NO o5gx08020 MAST.HST.S... 205.5466666... 28.3765278 http://archiv... NGC5272-BSSV1 1024
NO o5gx08030 MAST.HST.S... 205.5466666... 28.3765278 http://archiv... NGC5272-BSSV1 1024
NO o5gx09020 MAST.HST.S... 205.5466666... 28.3756944 http://archiv... NGC5272-BSSV2 1024
Download
Stop
Dismiss
memory
i.edu/pub/vospectra/stis/o5gx08010_sx1_vo.fits
i.edu/pub/vospectra/stis/o5gx08030_sx1_vo.fits
i.edu/pub/vospectra/stis/o5gx08020_sx1_vo.fits
Process
Delete
Dismiss
カラム幅も可変

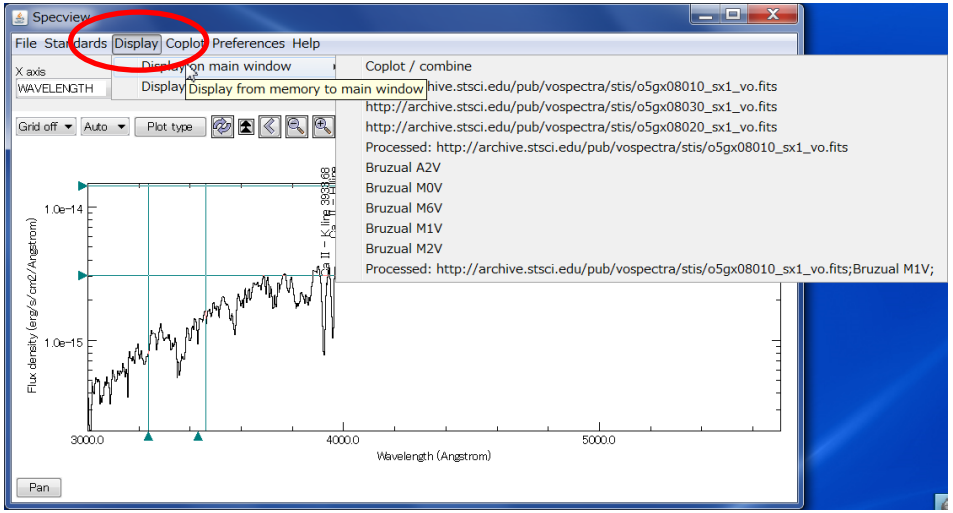
Tile 表示


Spectrograms in memory
File Help
Spectrogram
1 http://archive.stsci.edu/pub/vospectra/stis/o5gx08010_sx1_vo.fits
2 http://archive.stsci.edu/pub/vospectra/stis/o5gx08030_sx1_vo.fits
3 http://archive.stsci.edu/pub/vospectra/stis/o5gx08020_sx1_vo.fits
Plot/Coplo
Tile
Process
Delete
Dismiss
Tile plot selected spectra
Specview
Specview
Preferences Help
0.0
-5.0e-14
1
3000.0
4000.0
5000.0
5.0e-15
2
3800.0
3900.0
4000.0
5.0e-15
3
3800.0
3900.0
4000.0

表示


Spectrograms in memory
File Help
Spectrogram
1 http://archive.stsci.edu/pub/vospectra/stis/o5gx08010_sx1_vo.fits
2 http://archive.stsci.edu/pub/vospectra/stis/o5gx08030_sx1_vo.fits
3 http://archive.stsci.edu/pub/vospectra/stis/o5gx08020_sx1_vo.fits
Plot/Coplot
Tile
Process
Delete
Dismiss
Plot/coplot selected spectrum/spectra
Specview
File Standards Display Coplot Preferences Help
X axis
WAVELENGTH
Y axis
FLUX
3729.626
-4.234637E-14
Print
Redraw
Grid off
Auto
Plot type
Expand
Fit
Measure
Line IDs
Units
NGC5272-BSSV1
0.0
-5.0e-14
Flux density (ERGS/CM^2/S/A)
3000.0
4000.0
5000.0
Wavelength (ANGSTROMS)
Pan

表示するグラフの切替



<u>方法1</u>

Displayボタンから

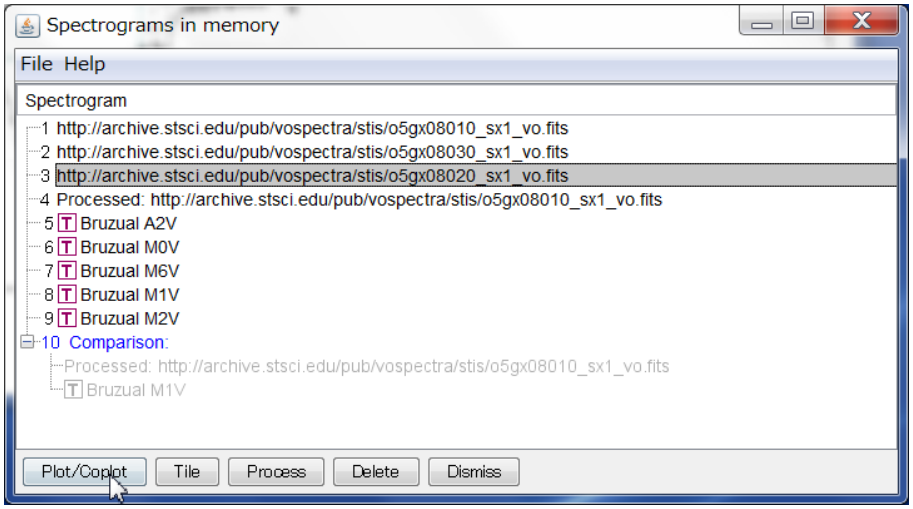
Display on main window

リストからグラフを選択。

　別なグラフを表示

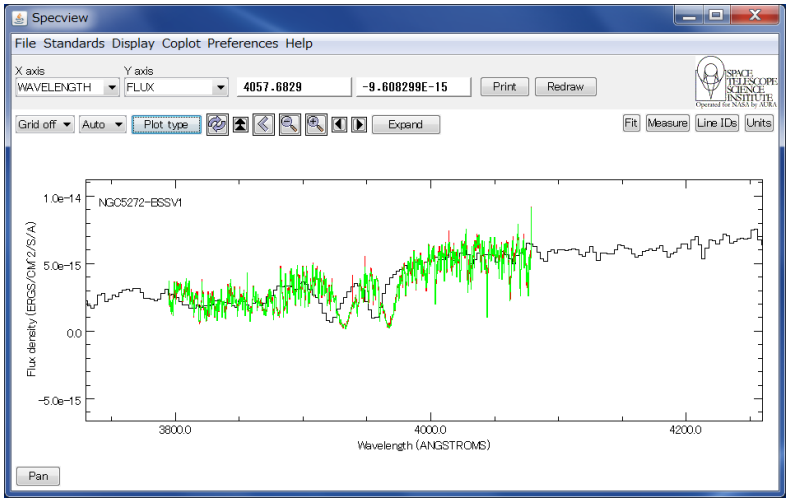
Display on secondary window:

　だと、新しいwindowを開いて、別なグラフを表示



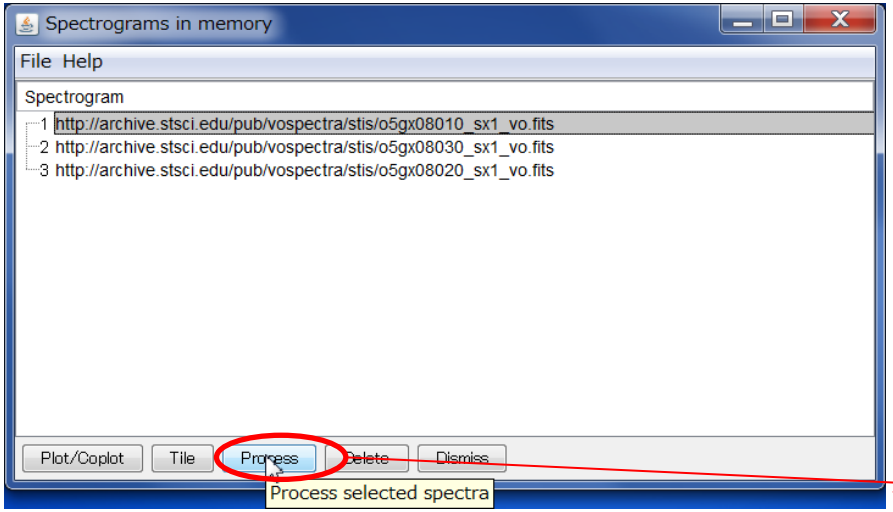
<u>方法2</u>

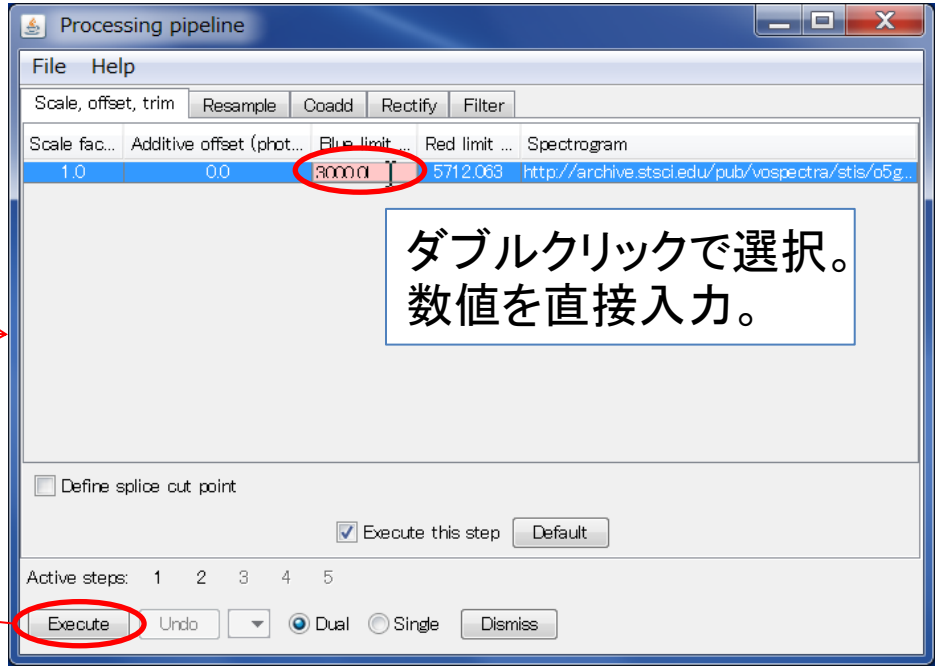
Coplotボタンから
ファイルリストを開き、グラフ
をマウスで選択して、
Plot/Coplot ボタンを押す。

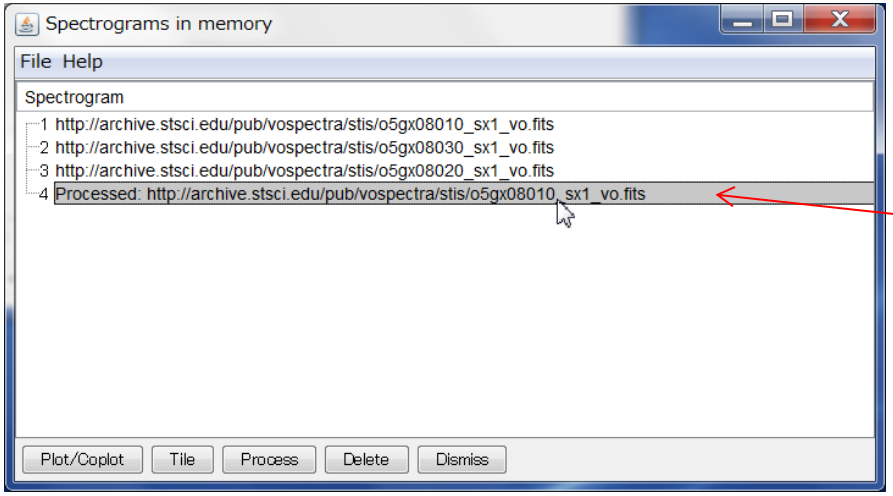


複数のグラフを重ねてplot
することもできる。

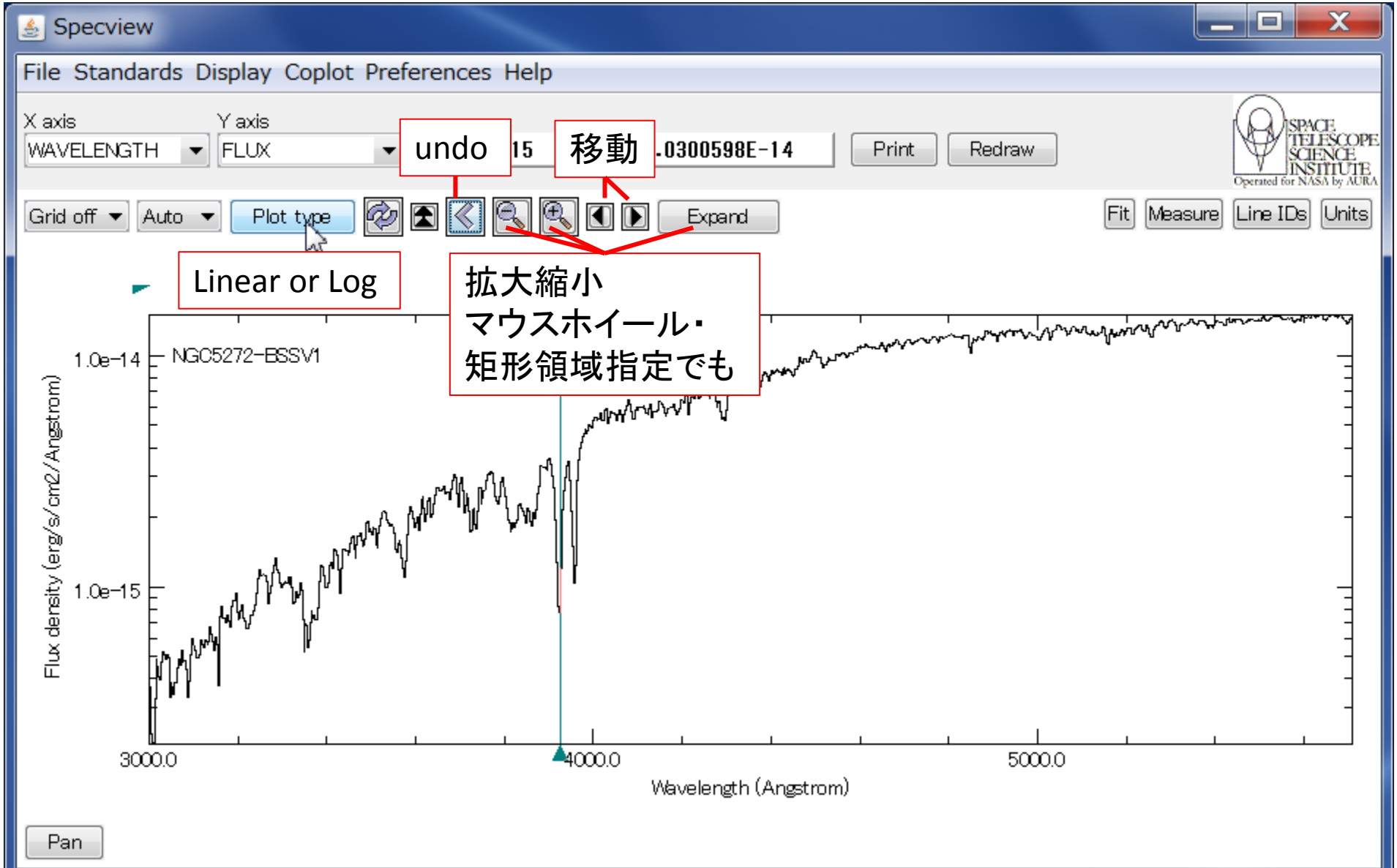
Process


Spectrograms in memory
File Help
Spectrogram
1 http://archive.stsci.edu/pub/vospectra/stis/o5gx08010_sx1_vo.fits
2 http://archive.stsci.edu/pub/vospectra/stis/o5gx08030_sx1_vo.fits
3 http://archive.stsci.edu/pub/vospectra/stis/o5gx08020_sx1_vo.fits
Plot/Coplot
Tile
Process
Delete
Dismiss
Process selected spectra

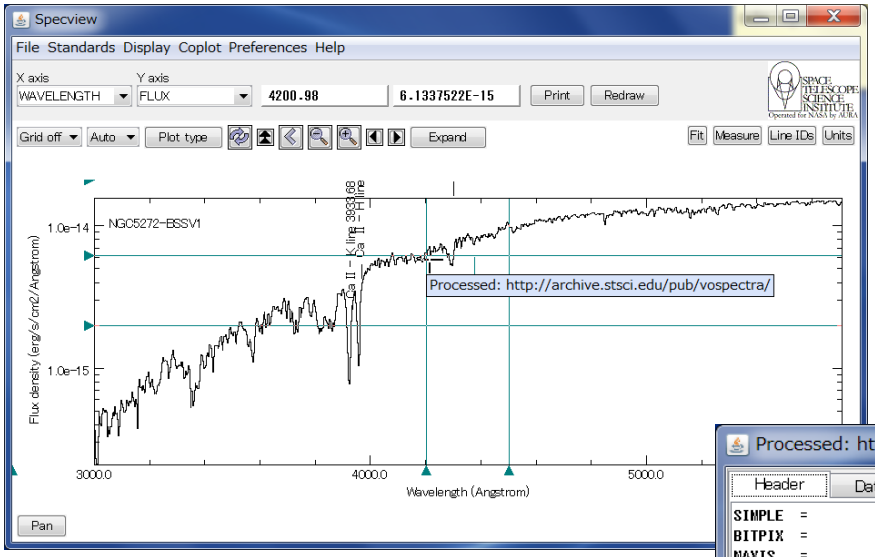

Processing pipeline
File Help
Scale, offset, trim
Resample
Coadd
Rectify
Filter
Scale fac...
Additive offset (phot...
Blue limit ...
Red limit ...
Spectrogram
1.0
0.0
3000.0
5712.063
http://archive.stsci.edu/pub/vospectra/stis/o5g...
ダブルクリックで選択。
数値を直接入力。
Define splice cut point
Execute this step
Default
Active steps: 1 2 3 4 5
Execute
Undo
Dual
Single
Dismiss

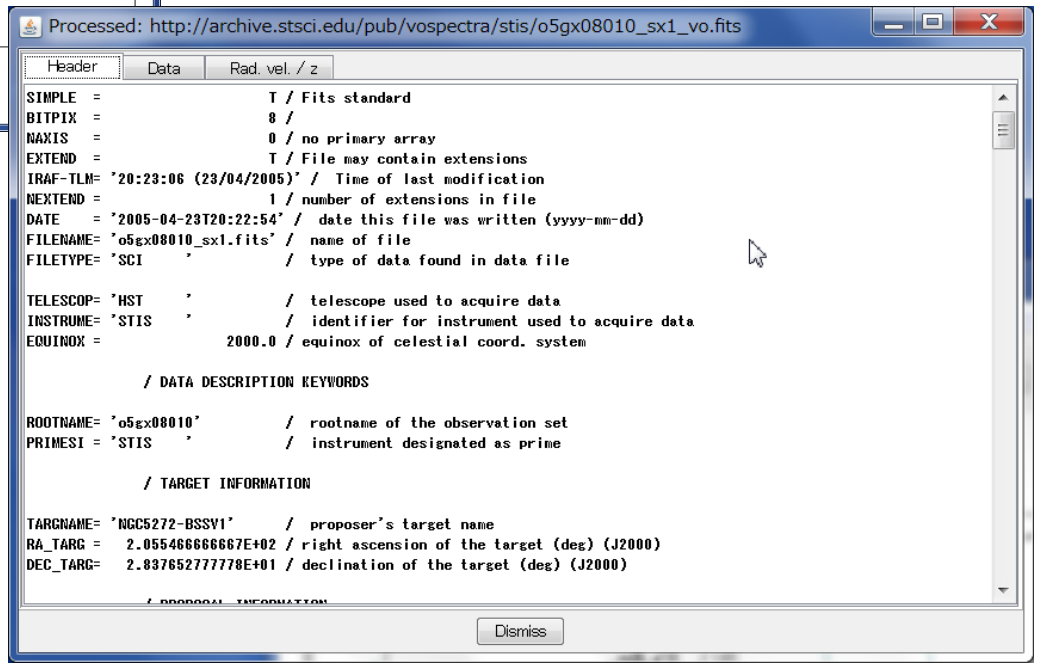

Spectrograms in memory
File Help
Spectrogram
1 http://archive.stsci.edu/pub/vospectra/stis/o5gx08010_sx1_vo.fits
2 http://archive.stsci.edu/pub/vospectra/stis/o5gx08030_sx1_vo.fits
3 http://archive.stsci.edu/pub/vospectra/stis/o5gx08020_sx1_vo.fits
4 Processed: http://archive.stsci.edu/pub/vospectra/stis/o5gx08010_sx1_vo.fits
Plot/Coplot
Tile
Process
Delete
Dismiss

表示


Specview
File Standards Display Coplot Preferences Help
X axis
WAVELENGTH
Y axis
FLUX
undo
移動
Print
Redraw
Grid off
Auto
Plot type
Expand
Fit
Measure
Line IDs
Units
Linear or Log
拡大縮小
マウスホイール・
矩形領域指定でも
NGC5272-BSSV1
1.0e-14
1.0e-15
Flux density (erg/s/cm2/Angstrom)
3000.0
4000.0
5000.0
Wavelength (Angstrom)
Pan

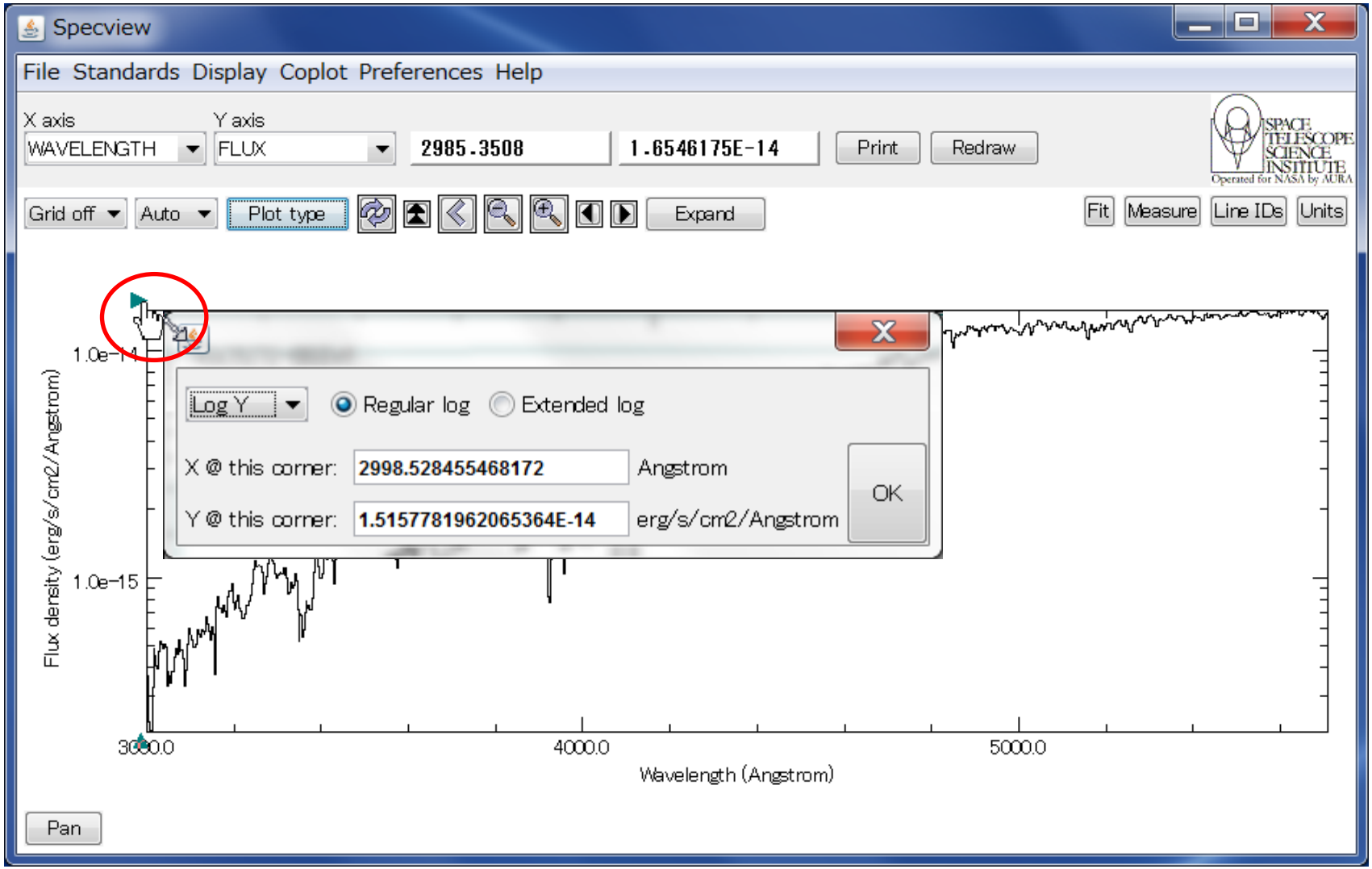
メタデータ表示



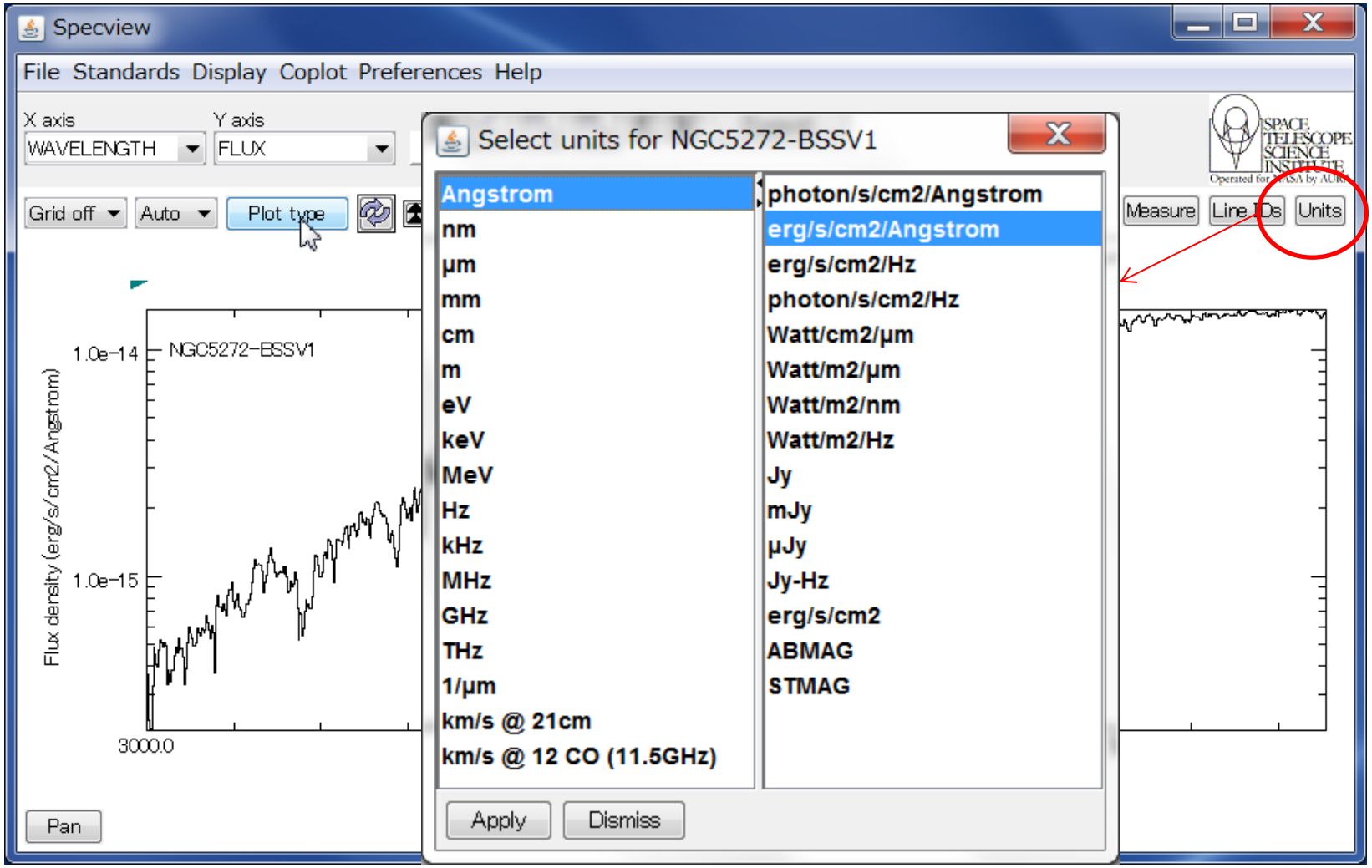


グラフのデータ曲線上で
左クリック：タイトル表示
右クリック：Header 表示

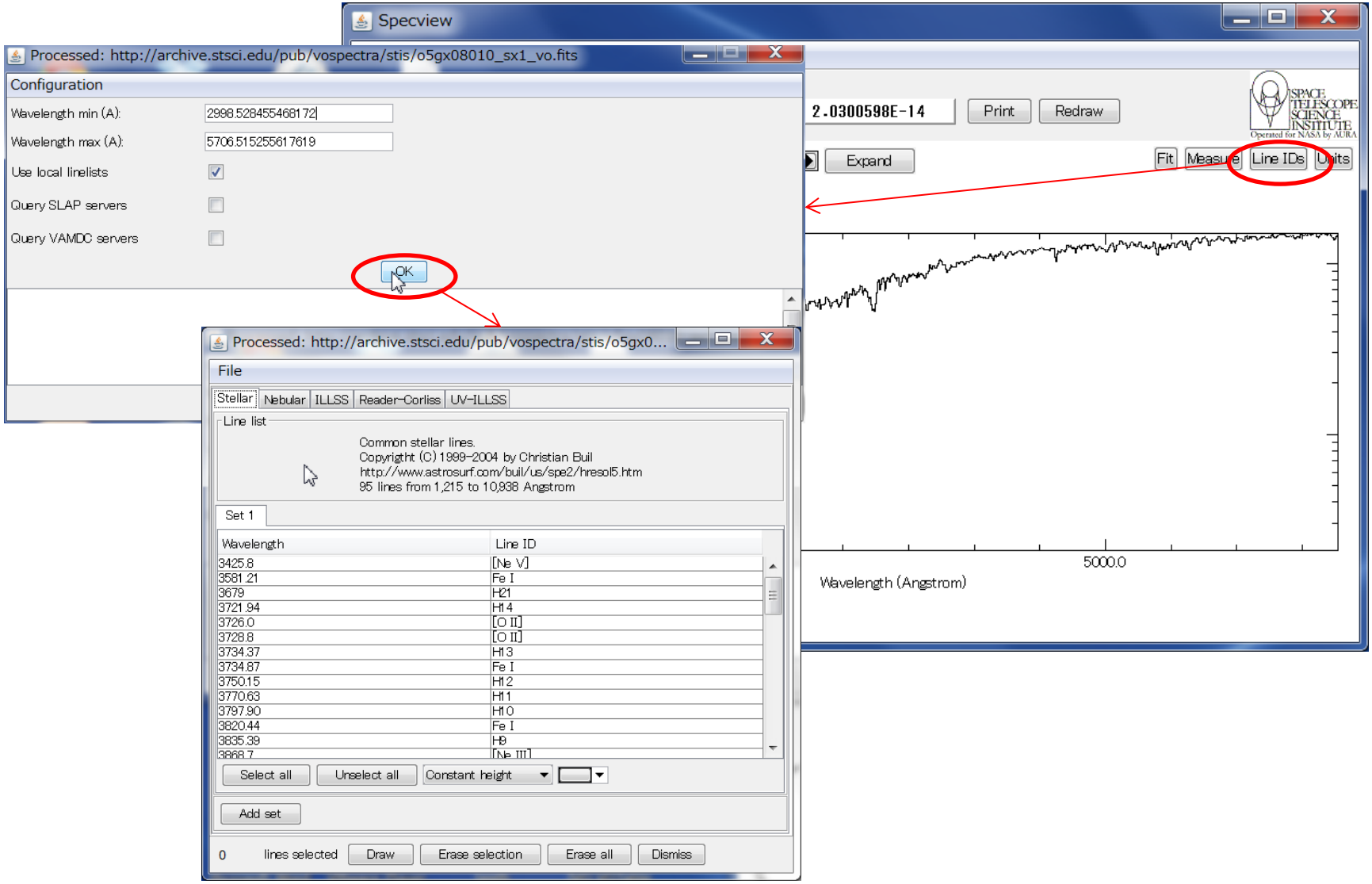
表示領域指定

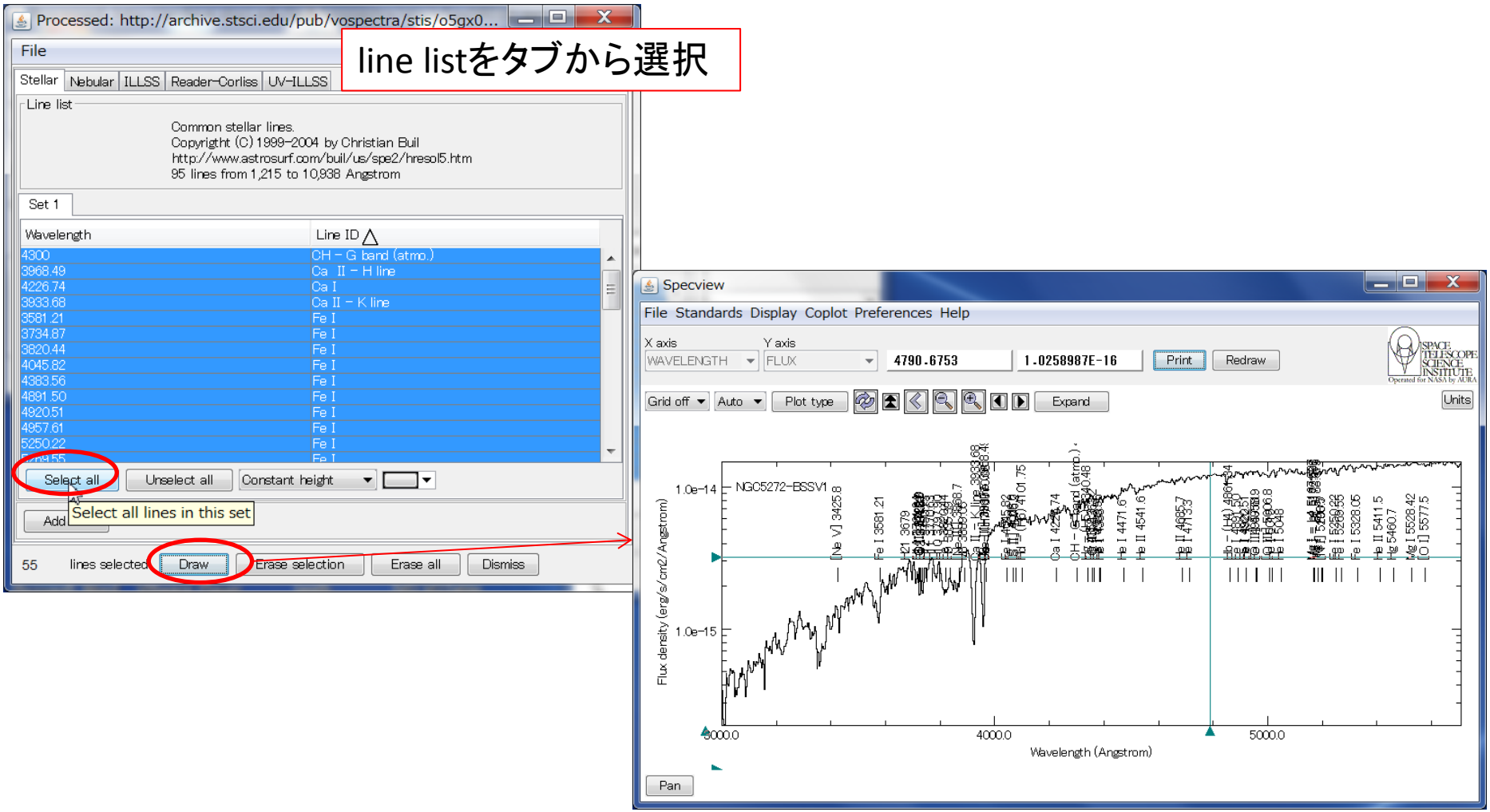

Specview
File Standards Display Coplot Preferences Help
X axis
WAVELENGTH
Y axis
FLUX
2985.3508
1.6546175E-14
Print
Redraw
SPACE TELESCOPE SCIENCE INSTITUTE
Operated for NASA by AURA
Grid off
Auto
Plot type
Expand
Fit
Measure
Line IDs
Units
Log Y
Regular log
Extended log
X @ this corner:
2998.528455468172
Angstrom
Y @ this corner:
1.5157781962065364E-14
erg/s/cm2/Angstrom
OK
1.0e-14
1.0e-15
Flux density (erg/s/cm2/Angstrom)
3000.0
4000.0
5000.0
Wavelength (Angstrom)
Pan

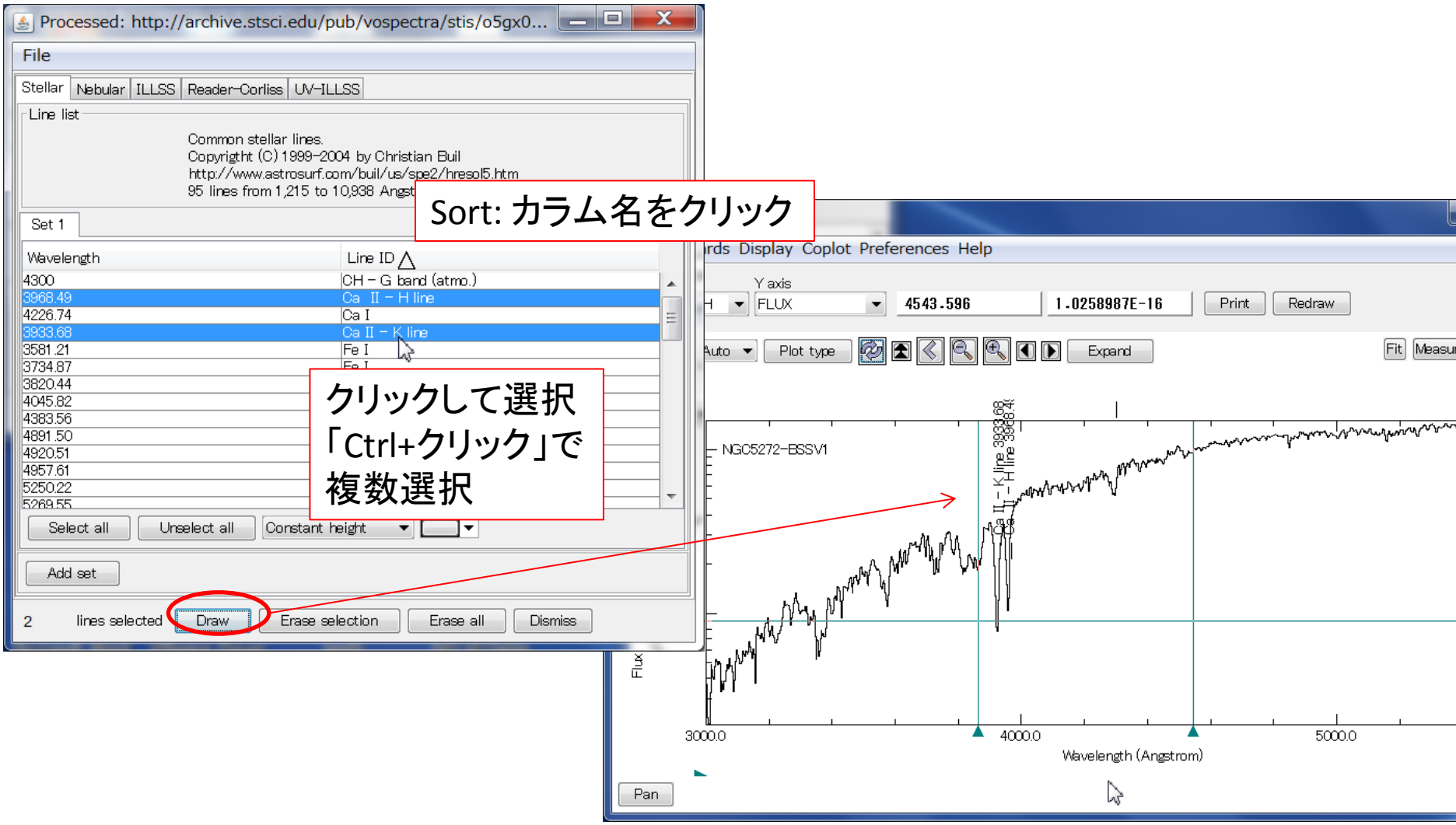
単位


Specview
File Standards Display Coplot Preferences Help
X axis
WAVELENGTH
Y axis
FLUX
Grid off
Auto
Plot type
Measure
Line IDs
Units
NGC5272-BSSV1
1.0e-14
1.0e-15
Flux density (erg/s/cm2/Angstrom)
3000.0
Pan
Select units for NGC5272-BSSV1
Angstrom
nm
μm
mm
cm
m
eV
keV
MeV
Hz
kHz
MHz
GHz
THz
1/μm
km/s @ 21cm
km/s @ 12 CO (11.5GHz)
photon/s/cm2/Angstrom
erg/s/cm2/Angstrom
erg/s/cm2/Hz
photon/s/cm2/Hz
Watt/cm2/μm
Watt/m2/μm
Watt/m2/nm
Watt/m2/Hz
Jy
mJy
μJy
Jy-Hz
erg/s/cm2
ABMAG
STMAG
Apply
Dismiss

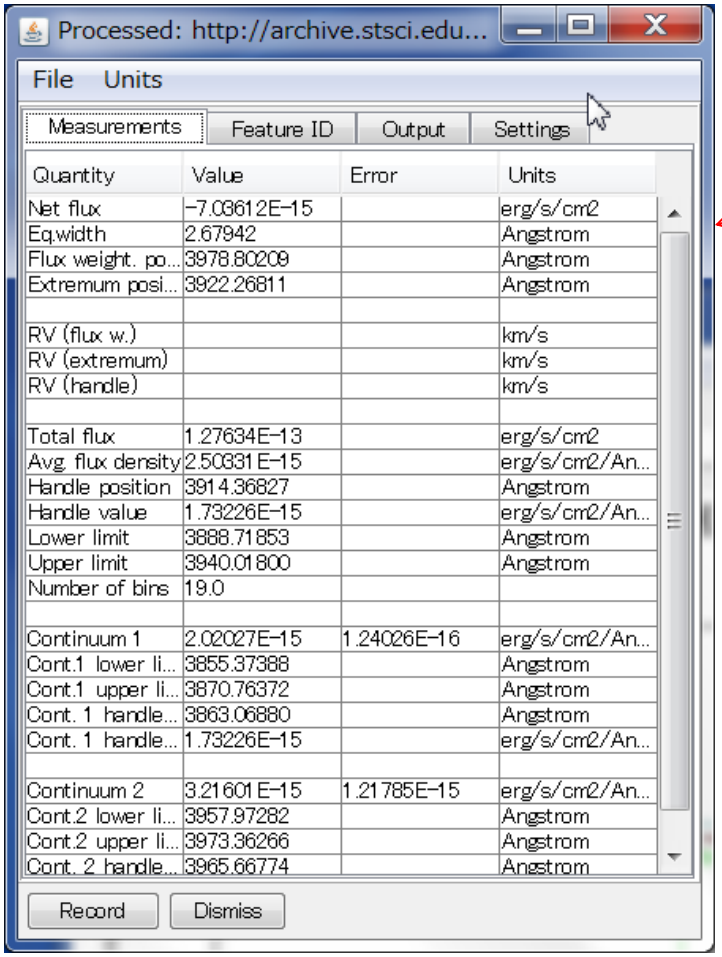
Line

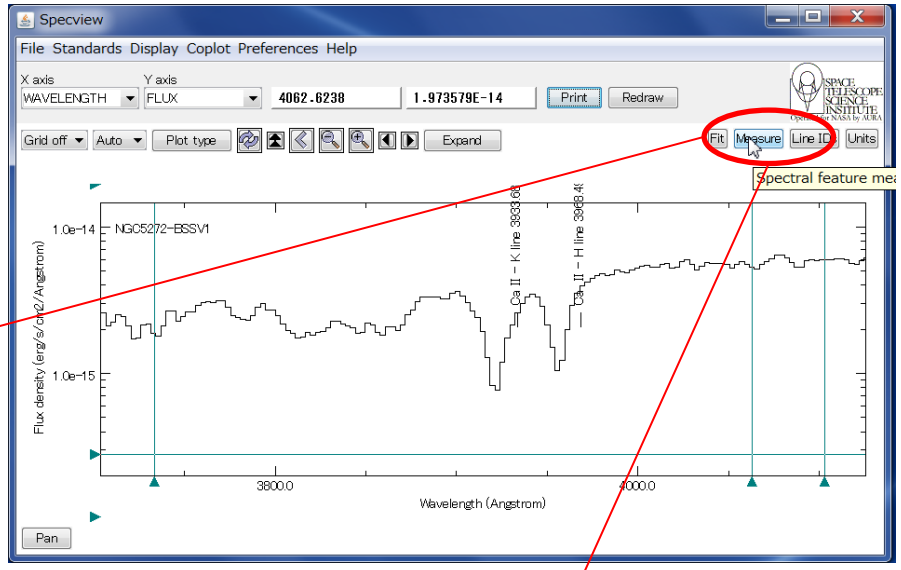

Specview
Processed: http://archive.stsci.edu/pub/vospectra/stis/o5gx08010_sx1_vo.fits
Configuration
Wavelength min (A):
2998.528455468172
Wavelength max (A):
5706.515255617619
Use local linelists
Query SLAP servers
Query VAMDC servers
OK
Processed: http://archive.stsci.edu/pub/vospectra/stis/o5gx0...
File
Stellar
Nebular
ILLSS
Reader-Corliss
UV-ILLSS
Line list
Common stellar lines.
Copyright (C) 1999-2004 by Christian Buil
http://www.astrosurf.com/buil/us/spe2/hresol5.htm
95 lines from 1,215 to 10,938 Angstrom
Set 1
Wavelength
Line ID
3425.8 [Ne V]
3581.21 Fe I
3679 H21
3721.94 H14
3726.0 [O II]
3728.8 [O II]
3734.37 H13
3734.87 Fe I
3750.15 H12
3770.63 H11
3797.90 H10
3820.44 Fe I
3835.39 H9
3868.7 [Ne III]
Select all
Unselect all
Constant height
Add set
0 lines selected
Draw
Erase selection
Erase all
Dismiss
2.0300598E-14
Print
Redraw
Expand
Fit
Measure
Line IDs
Units
SPACE TELESCOPE SCIENCE INSTITUTE
Operated for NASA by AURA
5000.0
Wavelength (Angstrom)

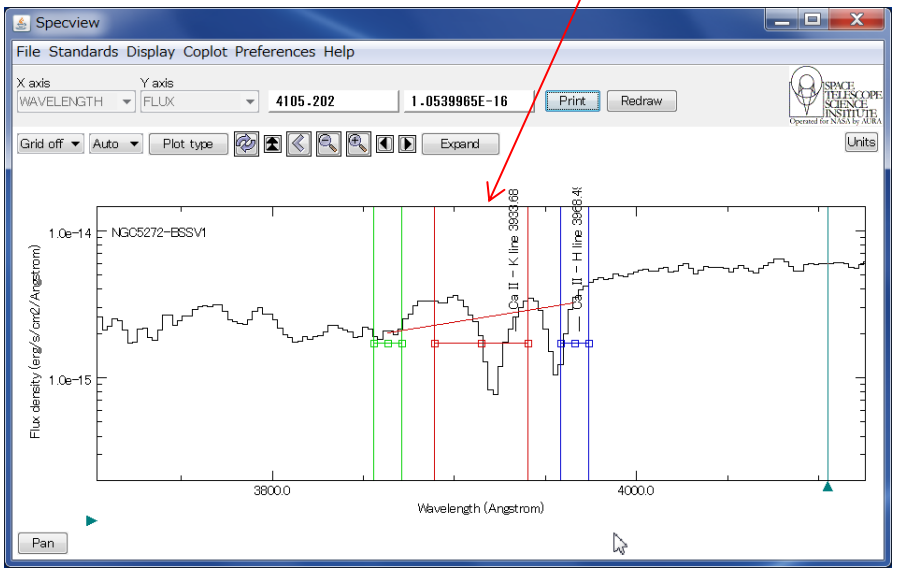

line listをタブから選択
Processed: http://archive.stsci.edu/pub/vospectra/stis/o5gx0...
File
Stellar
Nebular
ILLSS
Reader-Corliss
UV-ILLSS
Line list
Common stellar lines.
Copyrigtht (C) 1999-2004 by Christian Buil
http://www.astrosurf.com/buil/us/spe2/hresol5.htm
95 lines from 1,215 to 10,938 Angstrom
Set 1
Wavelength
Line ID
4300 CH - G band (atmo.)
3968.49 Ca II - H line
4226.74 Ca I
3933.68 Ca II - K line
3581.21 Fe I
3734.87 Fe I
3820.44 Fe I
4045.82 Fe I
4383.56 Fe I
4891.50 Fe I
4920.51 Fe I
4957.61 Fe I
5250.22 Fe I
Select all
Unselect all
Constant height
Select all lines in this set
Add
55 lines selected
Draw
Erase selection
Erase all
Dismiss
Specview
File Standards Display Coplot Preferences Help
X axis
Y axis
WAVELENGTH
FLUX
4790.6753
1.0258987E-16
Print
Redraw
Grid off
Auto
Plot type
Expand
Units
NGC5272-BSSV1
1.0e-14
1.0e-15
Flux density (erg/s/cm2/Angstrom)
3000.0
4000.0
5000.0
Wavelength (Angstrom)
Pan

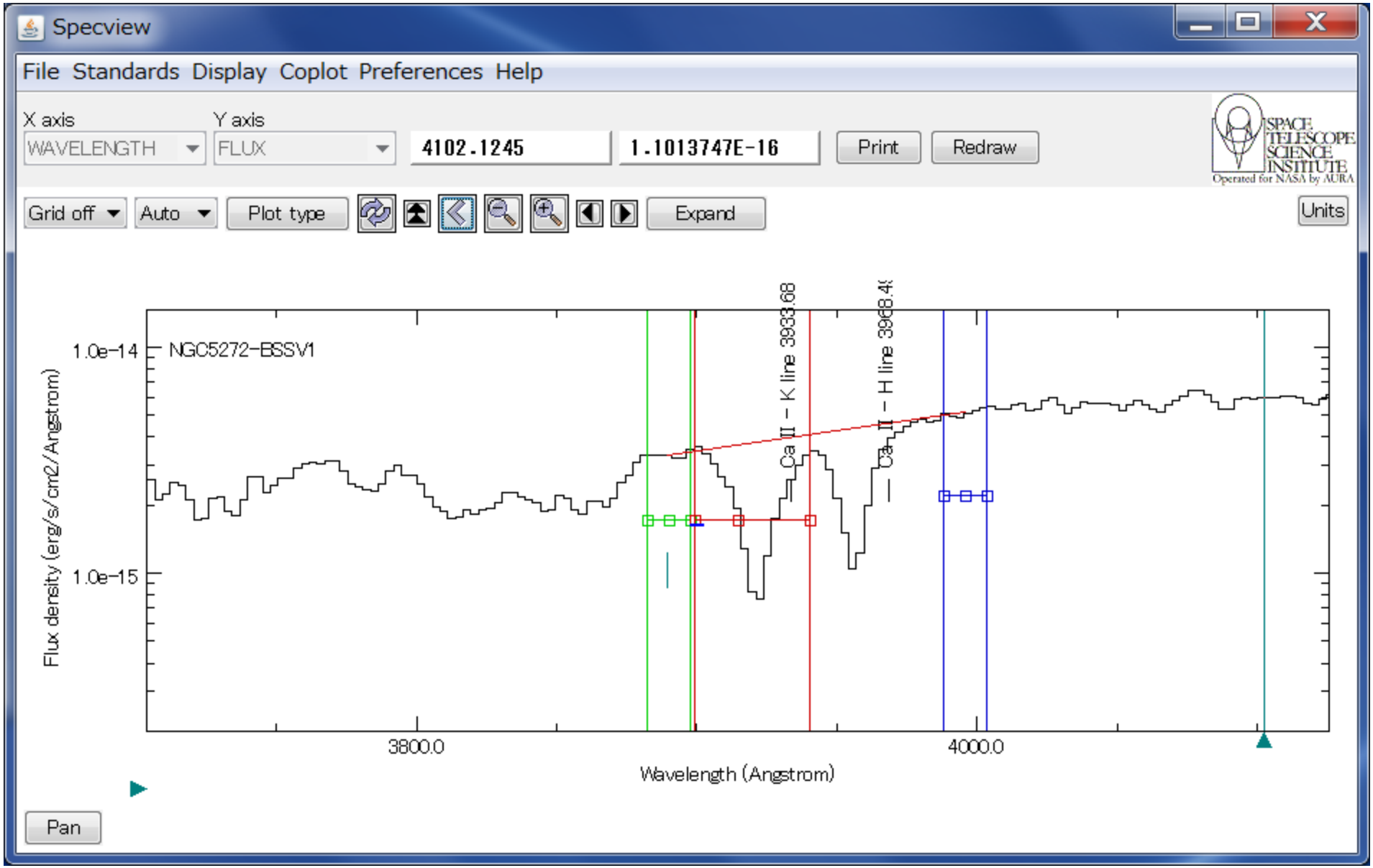

Processed: http://archive.stsci.edu/pub/vospectra/stis/o5gx0...
File
Stellar
Nebular
ILLSS
Reader-Corliss
UV-ILLSS
Line list
Common stellar lines.
Copyrigtht (C) 1999-2004 by Christian Buil
http://www.astrosurf.com/buil/us/spe2/hresol5.htm
95 lines from 1,215 to 10,938 Angst
Set 1
Wavelength
Line ID
4300 CH - G band (atmo.)
3968.49 Ca II - H line
4226.74 Ca I
3933.68 Ca II - K line
3581.21 Fe I
3734.87
3820.44
4045.82
4383.56
4891.50
4920.51
4957.61
5250.22
Select all
Unselect all
Constant height
Add set
2 lines selected
Draw
Erase selection
Erase all
Dismiss
Sort: カラム名をクリック
クリックして選択
「Ctrl+クリック」で
複数選択
rds Display Coplot Preferences Help
Y axis
FLUX
4543.596
1.0258987E-16
Print
Redraw
Auto
Plot type
Expand
Fit
NGC5272-BSSV1
Ca II - K line 3933.68
Ca II - H line 3968.47
Flux
3000.0
4000.0
5000.0
Wavelength (Angstrom)
Pan

Line測定

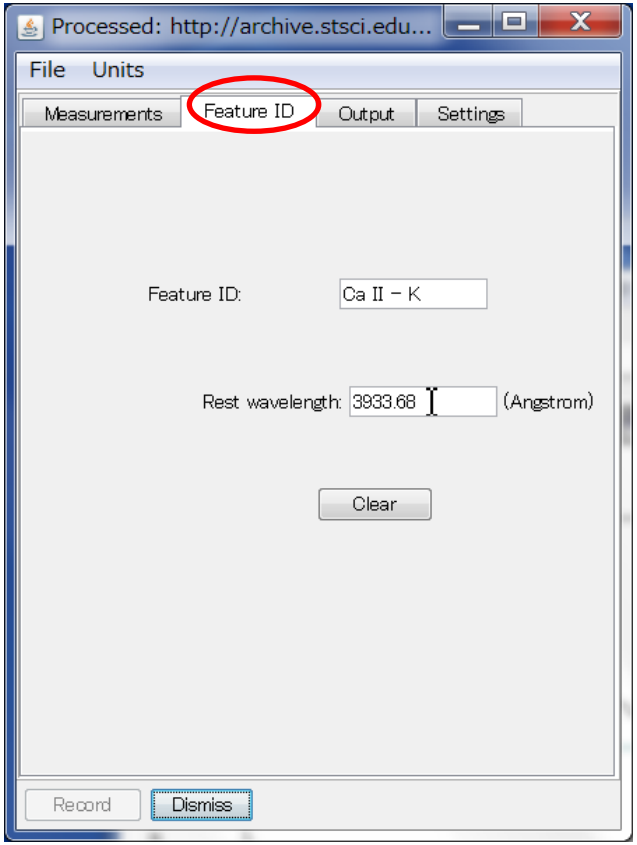

Processed: http://archive.stsci.edu...
File Units
Measurements
Feature ID
Output
Settings
Quantity | Value | Error | Units
Net flux | -7.03612E-15 | | erg/s/cm2
Eq.width | 2.67942 | | Angstrom
Flux weight. po... | 3978.80209 | | Angstrom
Extremum posi... | 3922.26811 | | Angstrom
RV (flux w.) | | | km/s
RV (extremum) | | | km/s
RV (handle) | | | km/s
Total flux | 1.27634E-13 | | erg/s/cm2
Avg. flux density | 2.50331E-15 | | erg/s/cm2/An...
Handle position | 3914.36827 | | Angstrom
Handle value | 1.73226E-15 | | erg/s/cm2/An...
Lower limit | 3888.71853 | | Angstrom
Upper limit | 3940.01800 | | Angstrom
Number of bins | 19.0 | | |
Continuum 1 | 2.02027E-15 | 1.24026E-16 | erg/s/cm2/An...
Cont.1 lower li... | 3855.37388 | | Angstrom
Cont.1 upper li... | 3870.76372 | | Angstrom
Cont. 1 handle... | 3863.06880 | | Angstrom
Cont. 1 handle... | 1.73226E-15 | | erg/s/cm2/An...
Continuum 2 | 3.21601E-15 | 1.21785E-15 | erg/s/cm2/An...
Cont.2 lower li... | 3957.97282 | | Angstrom
Cont.2 upper li... | 3973.36266 | | Angstrom
Cont. 2 handle... | 3965.66774 | | Angstrom
Record
Dismiss

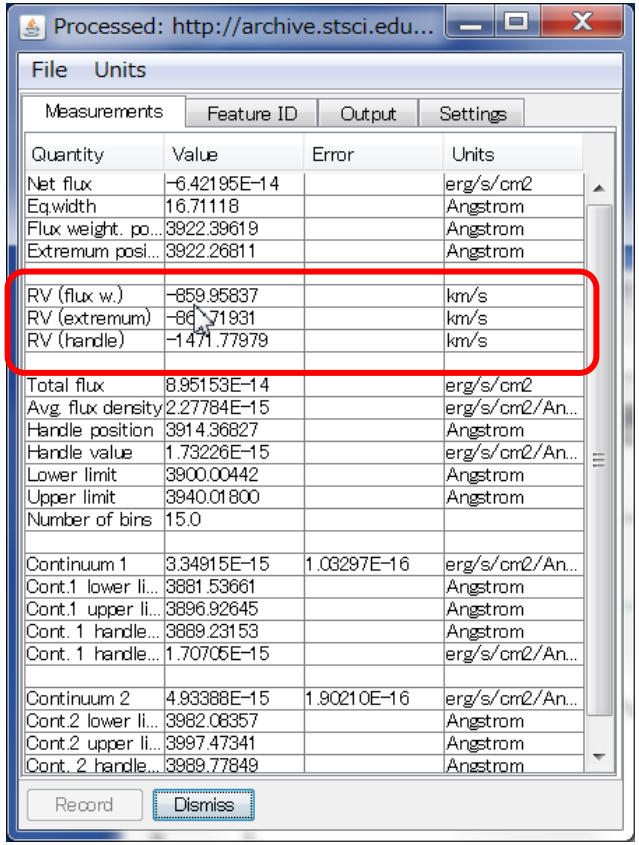

Specview
File Standards Display Coplot Preferences Help
X axis
WAVELENGTH
Y axis
FLUX
4062.6238
1.973579E-14
Print
Redraw
Grid off
Auto
Plot type
Expand
Fit
Measure
Line ID
Units
Spectral feature mea
NGC5272-BSSV1
Ca II - K line 3933.68
Ca II - H line 3968.47
1.0e-14
1.0e-15
Flux density (erg/s/cm2/Angstrom)
3800.0
4000.0
Wavelength (Angstrom)
Pan

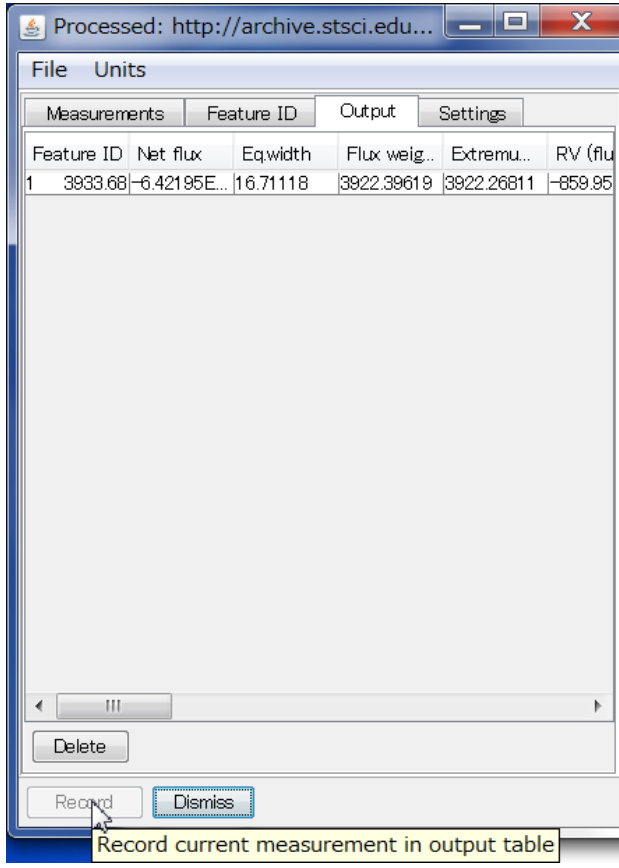

Specview
File Standards Display Coplot Preferences Help
X axis
WAVELENGTH
Y axis
FLUX
4105.202
1.0539965E-16
Print
Redraw
Grid off
Auto
Plot type
Expand
Units
NGC5272-BSSV1
Ca II - K line 3933.68
Ca II - H line 3968.47
1.0e-14
1.0e-15
Flux density (erg/s/cm2/Angstrom)
3800.0
4000.0
Wavelength (Angstrom)
Pan


Specview
File Standards Display Coplot Preferences Help
X axis
WAVELENGTH
Y axis
FLUX
4102.1245
1.1013747E-16
Print
Redraw
SPACE TELESCOPE SCIENCE INSTITUTE
Operated for NASA by AURA
Grid off
Auto
Plot type
Expand
Units
NGC5272-BSSV1
1.0e-14
1.0e-15
Flux density (erg/s/cm2/Angstrom)
Ca II - K line 3933.68
Ca II - H line 3968.4
3800.0
4000.0
Wavelength (Angstrom)
Pan

視線速度測定



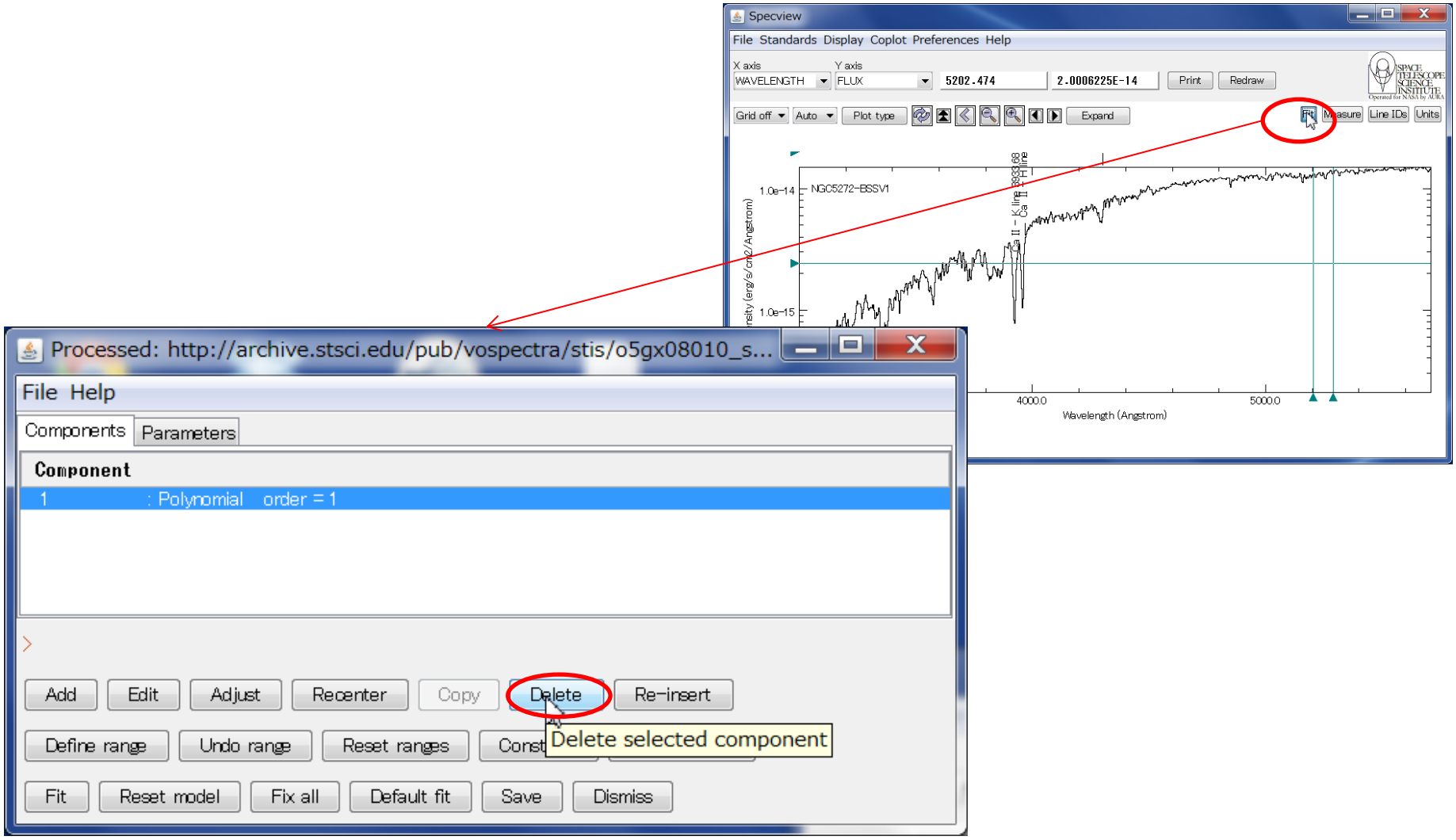


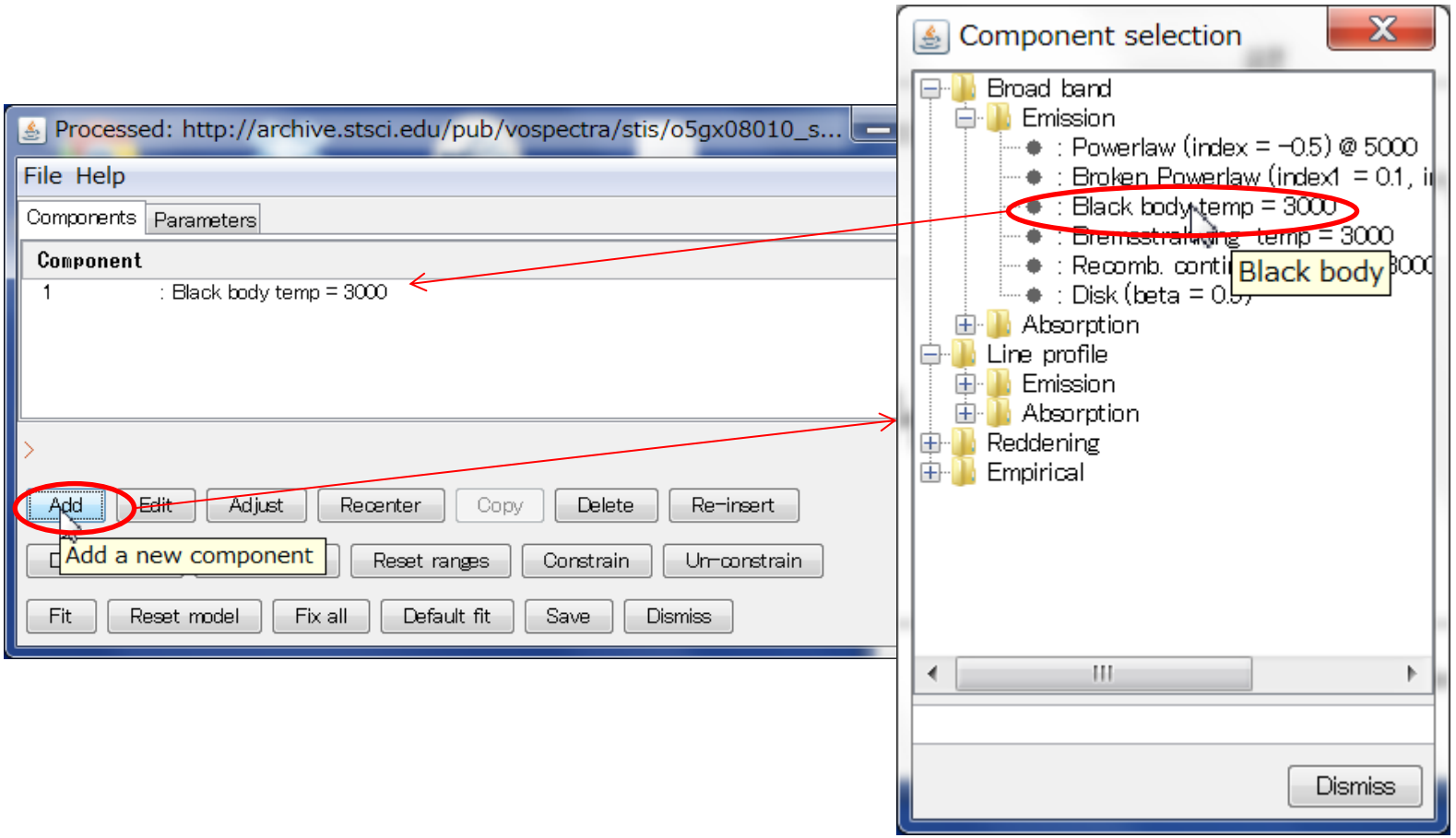


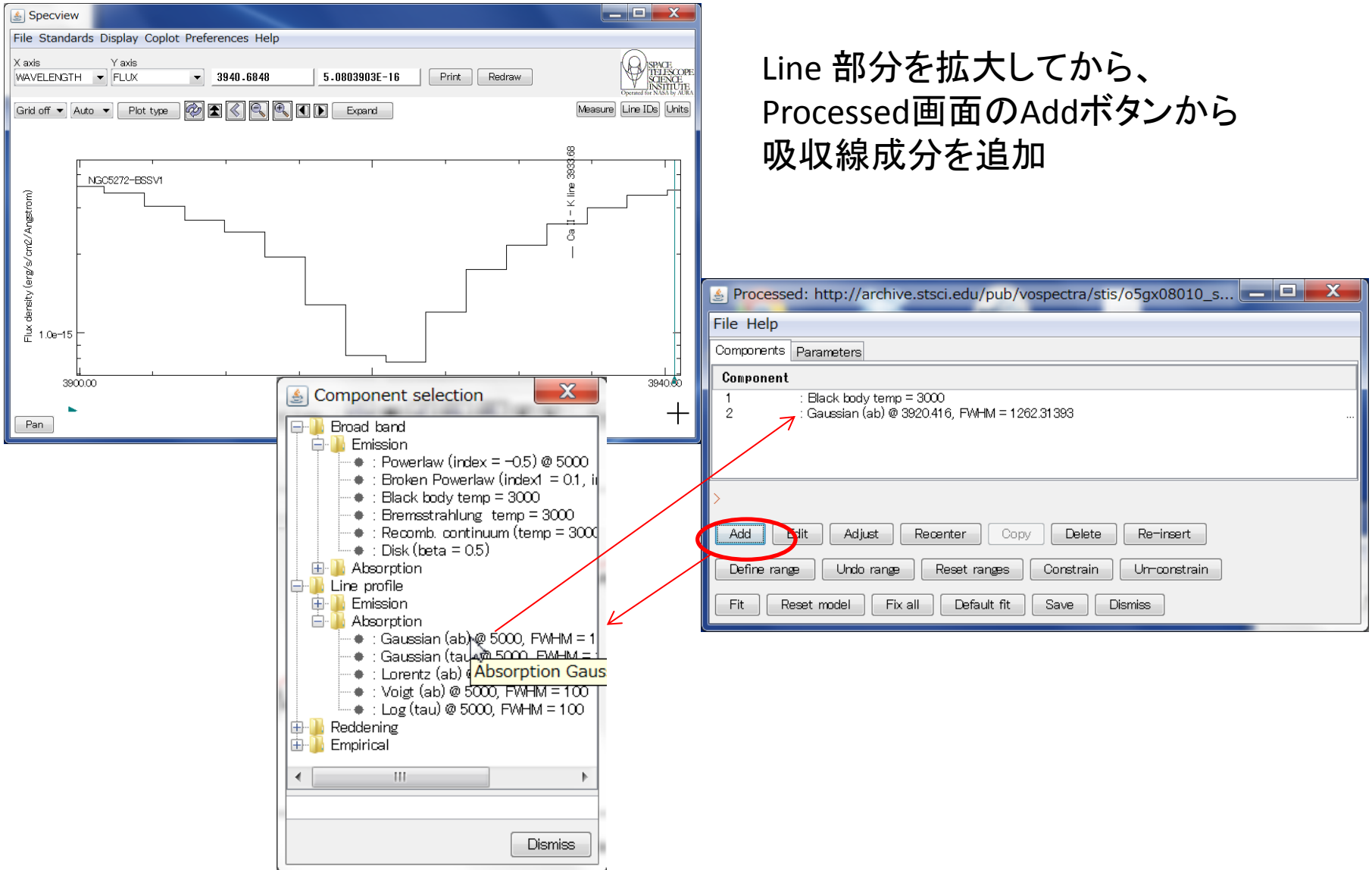
Line測定画面で、Feature ID タブを開き、Rest wavelength に静止系での周波数を入力すると、Measurement タブに計算された視線速度が表示される。

測定結果はRecord ボタンで記録。
File -> Save as で保存。

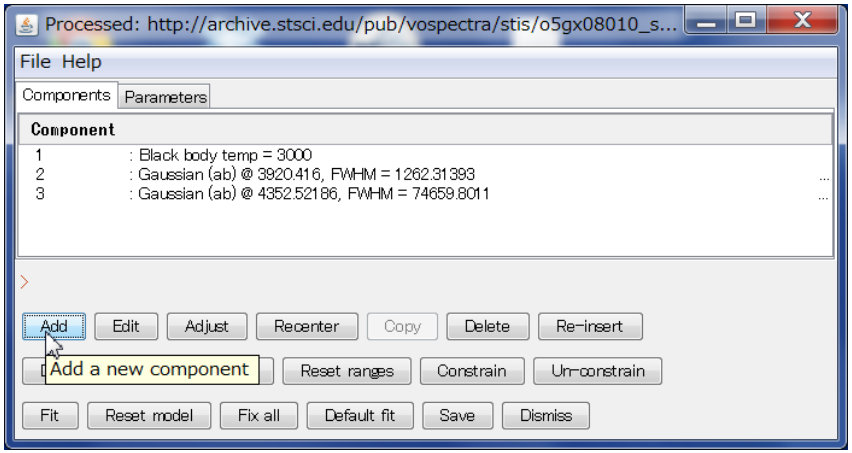
Fit: 成分の構成

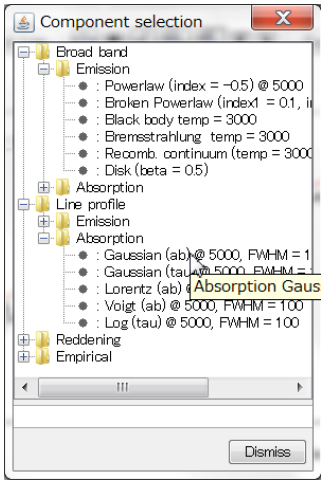

Specview
File Standards Display Coplot Preferences Help
X axis
WAVELENGTH
Y axis
FLUX
5202.474
2.0006225E-14
Print
Redraw
Grid off
Auto
Plot type
Expand
Measure
Line IDs
Units
NGC5272-BSSV1
Ca II - K line 3933.68
H line
1.0e-14
1.0e-15
4000.0
5000.0
Wavelength (Angstrom)
Processed: http://archive.stsci.edu/pub/vospectra/stis/o5gx08010_s...
File Help
Components
Parameters
Component
1 : Polynomial order = 1
Add
Edit
Adjust
Recenter
Copy
Delete
Re-insert
Define range
Undo range
Reset ranges
Delete selected component
Fit
Reset model
Fix all
Default fit
Save
Dismiss

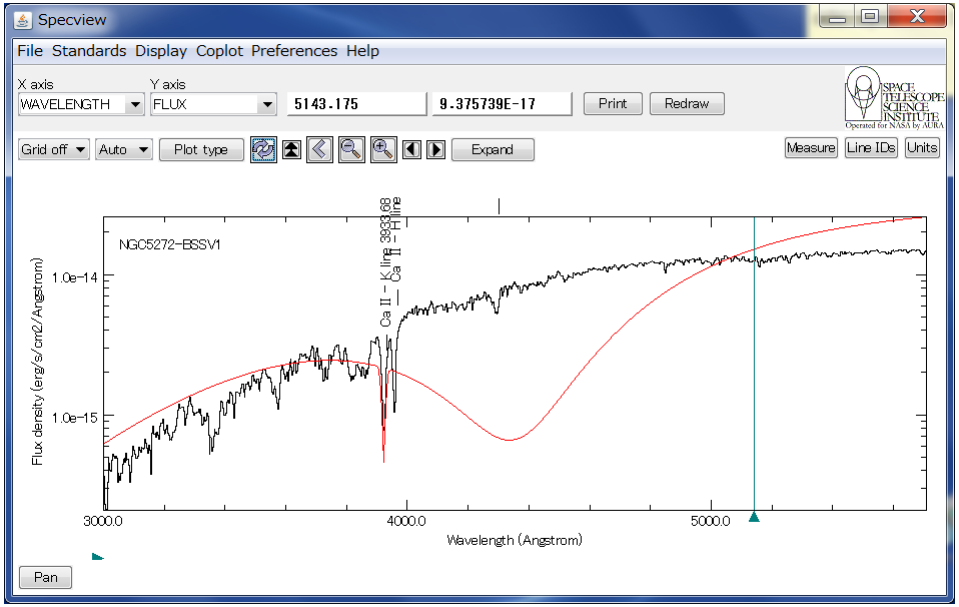

Processed: http://archive.stsci.edu/pub/vospectra/stis/o5gx08010_s...
File Help
Components
Parameters
Component
1 : Black body temp = 3000
Add
Edit
Adjust
Recenter
Copy
Delete
Re-insert
Add a new component
Reset ranges
Constrain
Un-constrain
Fit
Reset model
Fix all
Default fit
Save
Dismiss
Component selection
Broad band
Emission
: Powerlaw (index = −0.5) @ 5000
: Broken Powerlaw (index1 = 0.1, i
: Black body temp = 3000
: Bremsstrahlung temp = 3000
: Recomb. conti
Black body
: Disk (beta = 0.5)
Absorption
Line profile
Emission
Absorption
Reddening
Empirical
Dismiss



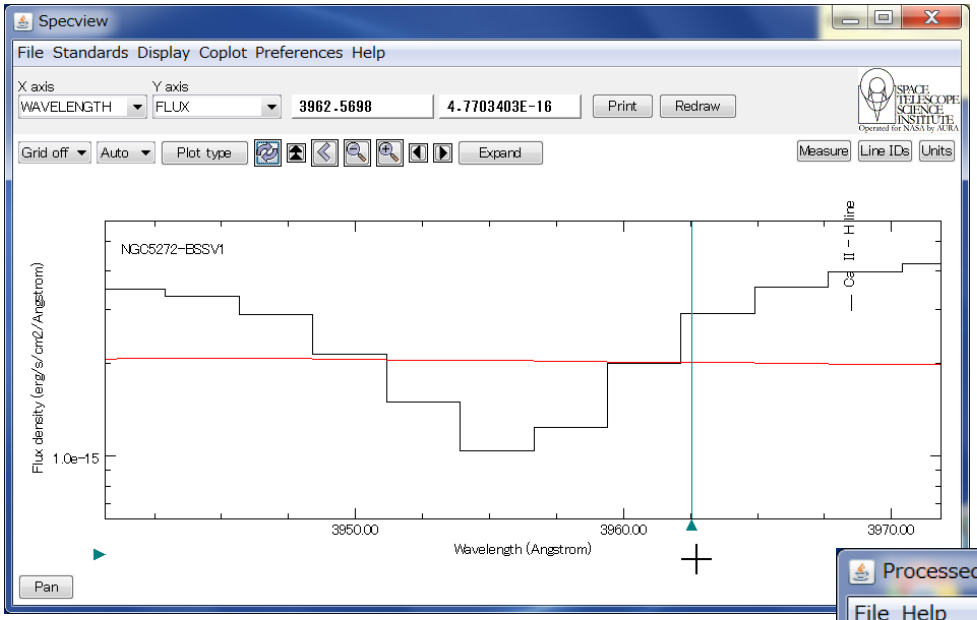
Line 部分を拡大してから、
Processed画面のAddボタンから
吸収線成分を追加

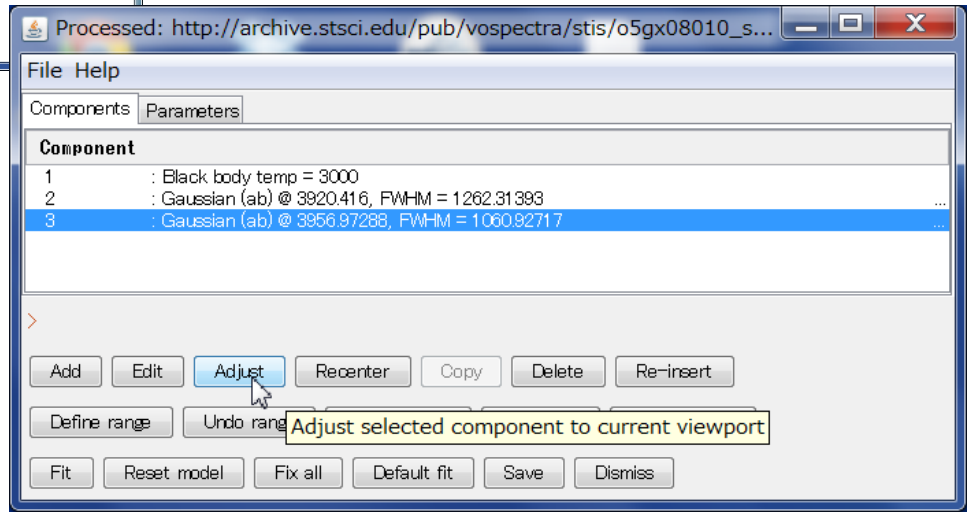






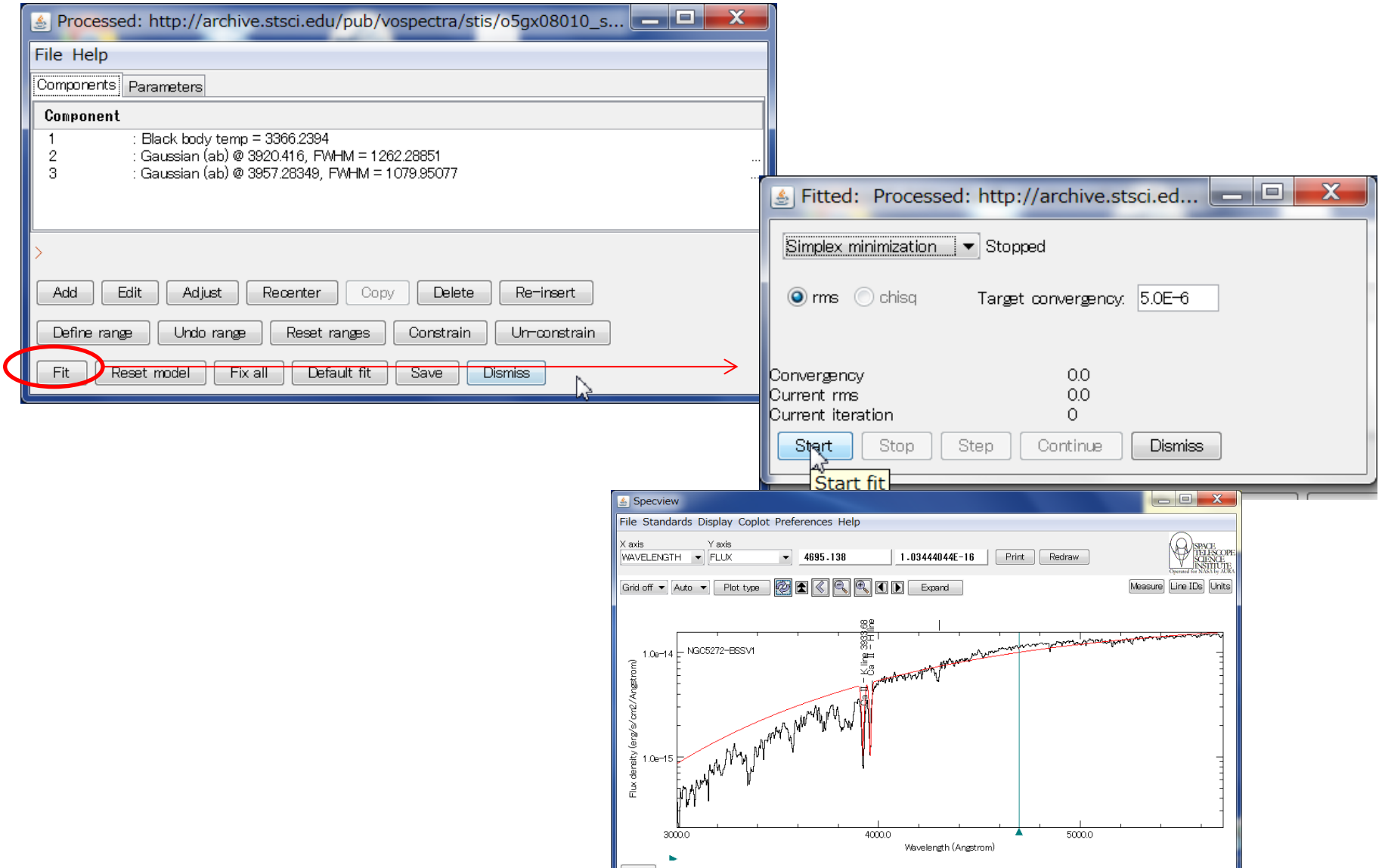
元の表示範囲でやると、
表示範囲全体の幅の吸収線が乗る

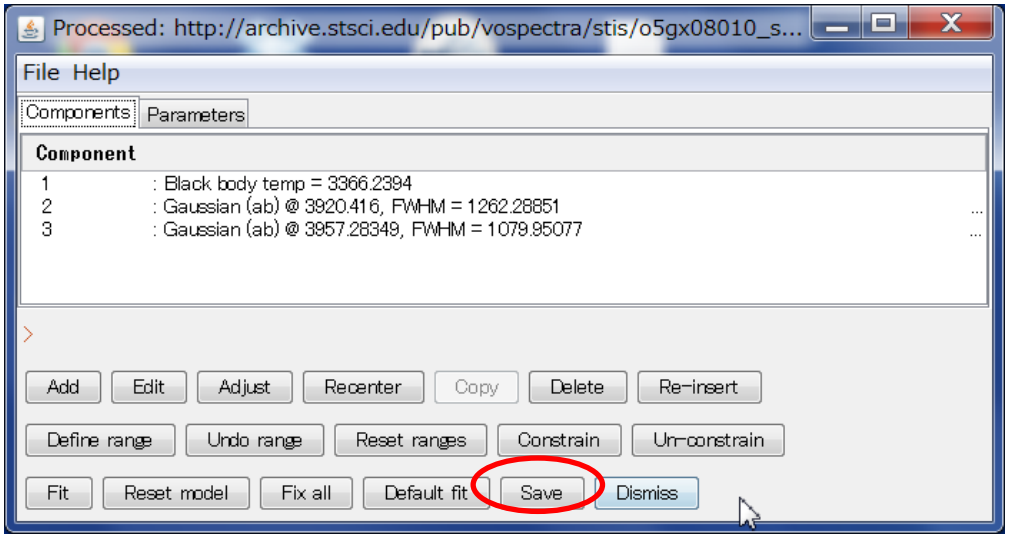




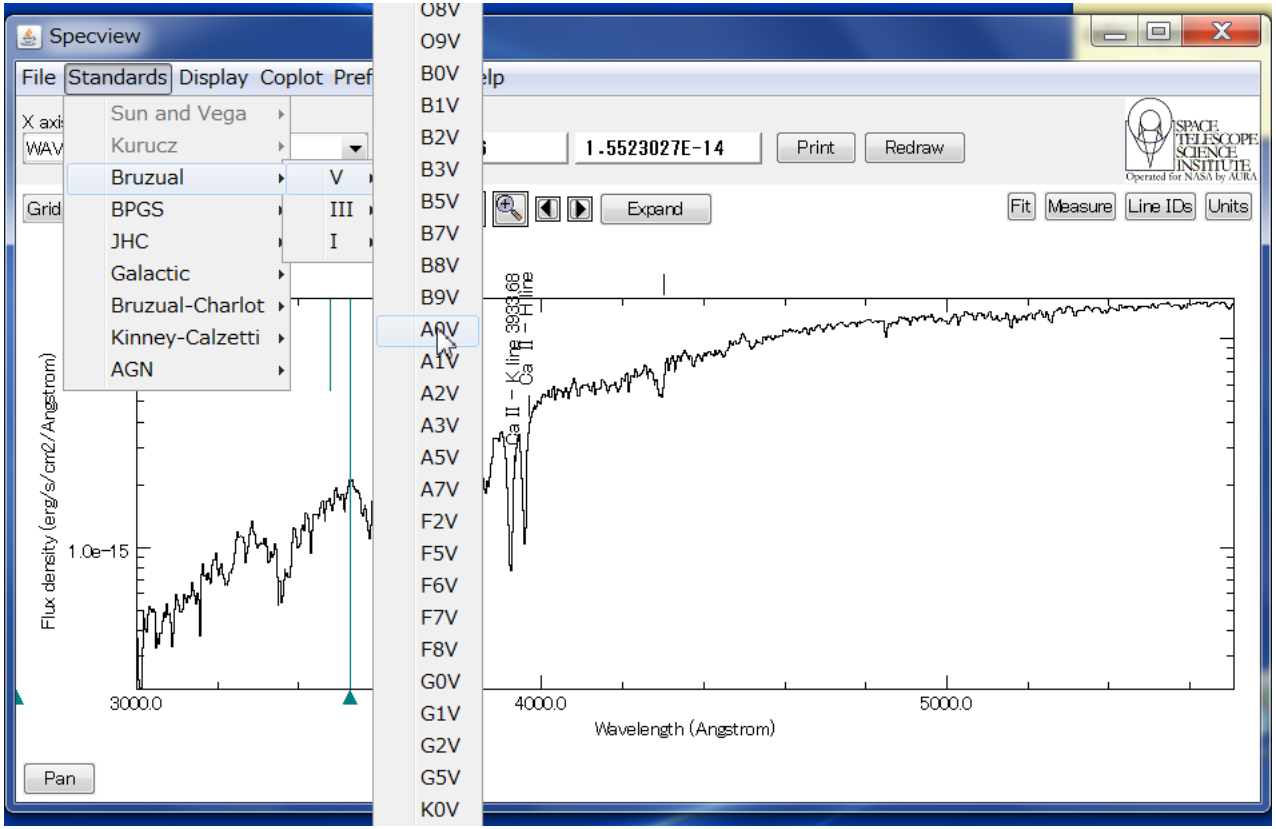
吸収線幅はAdjust ボタンで
変更できる

Fitting


Processed: http://archive.stsci.edu/pub/vospectra/stis/o5gx08010_s...
File Help
Components
Parameters
Component
1 : Black body temp = 3366.2394
2 : Gaussian (ab) @ 3920.416, FWHM = 1262.28851
3 : Gaussian (ab) @ 3957.28349, FWHM = 1079.95077
Add
Edit
Adjust
Recenter
Copy
Delete
Re-insert
Define range
Undo range
Reset ranges
Constrain
Un-constrain
Fit
Reset model
Fix all
Default fit
Save
Dismiss
Fitted: Processed: http://archive.stsci.ed...
Simplex minimization
Stopped
rms
chisq
Target convergency:
5.0E-6
Convergency
0.0
Current rms
0.0
Current iteration
0
Start
Stop
Step
Continue
Dismiss
Start fit
Specview
File Standards Display Coplot Preferences Help
X axis
WAVELENGTH
Y axis
FLUX
4695.138
1.03444044E-16
Print
Redraw
Grid off
Auto
Plot type
Expand
Measure
Line IDs
Units
NGC5272-BSSV1
Ca II K line
Ca II H line 3933.68
1.0e-14
1.0e-15
Flux density (erg/s/cm2/Angstrom)
3000.0
4000.0
5000.0
Wavelength (Angstrom)


Processed: http://archive.stsci.edu/pub/vospectra/stis/o5gx08010_s...
File Help
Components
Parameters
Component
1 : Black body temp = 3366.2394
2 : Gaussian (ab) @ 3920.416, FWHM = 1262.28851
3 : Gaussian (ab) @ 3957.28349, FWHM = 1079.95077
Add
Edit
Adjust
Recenter
Copy
Delete
Re-insert
Define range
Undo range
Reset ranges
Constrain
Un-constrain
Fit
Reset model
Fix all
Default fit
Save
Dismiss

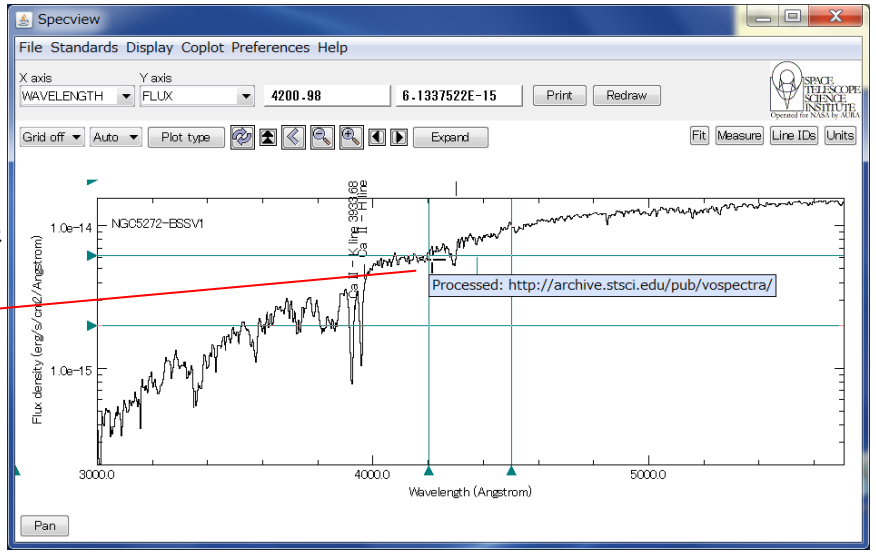
モデルスペクトルの読み込み

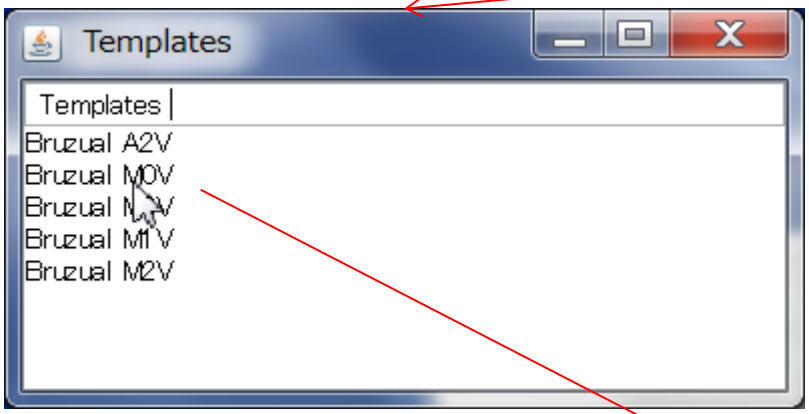


specview_standards.jar、specview_kurucz.jar
をダウンロードすると、Sun and Vega, Kurucz も
読み込めるようになる。

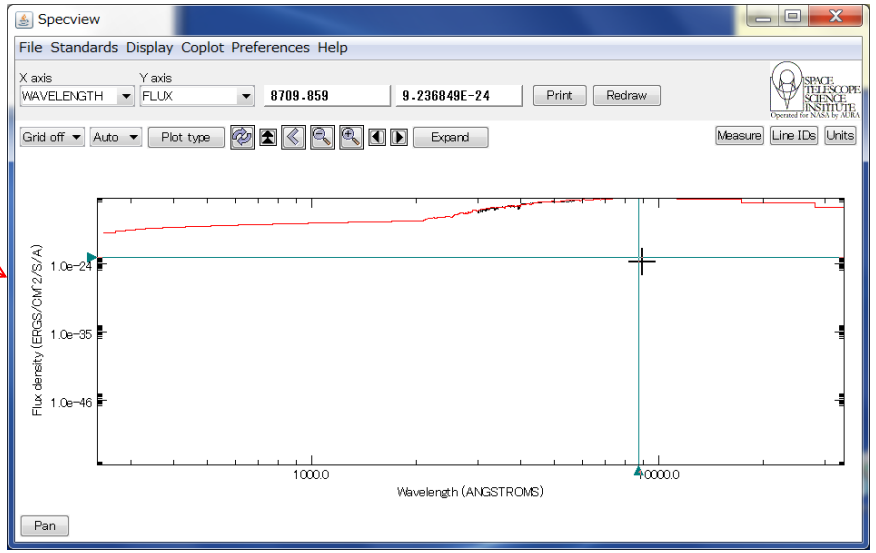
Data と Model の比較

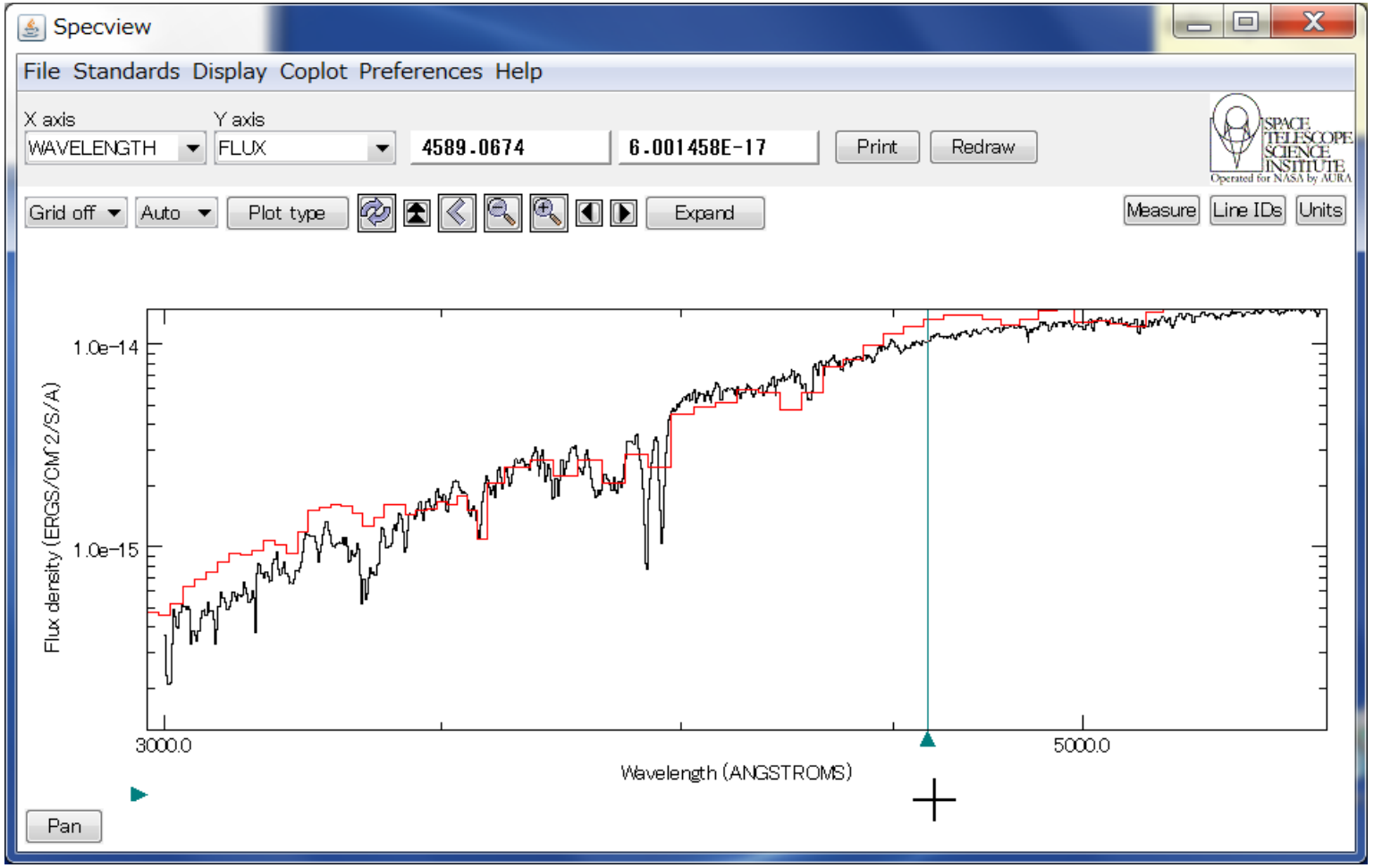
スペクトルデータ線上で
ダブルクリック





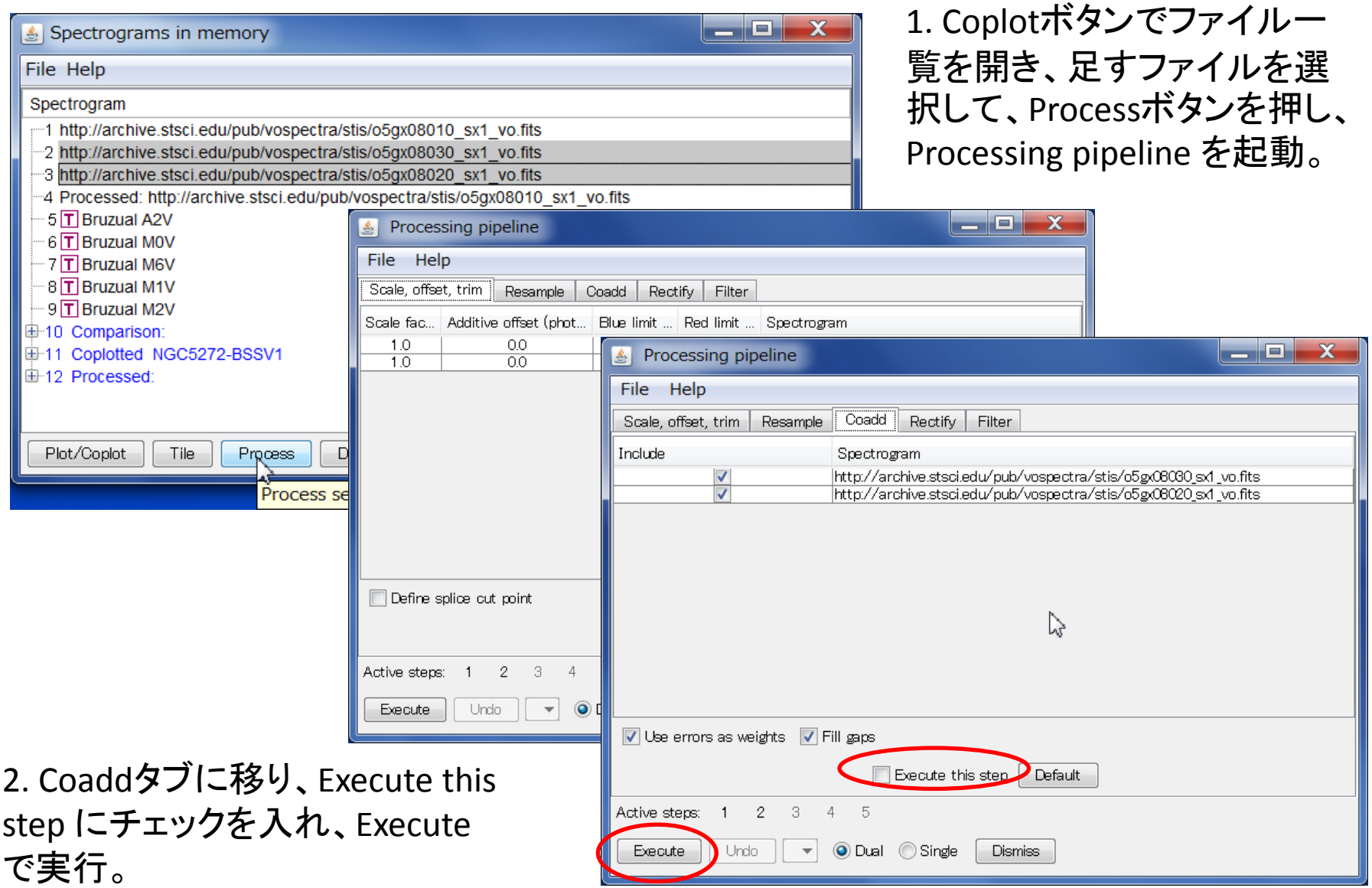
読み込んでおいたモデル
から一つを選択すると、
データと重ねて表示され
る。




Specview
File Standards Display Coplot Preferences Help
X axis
WAVELENGTH
Y axis
FLUX
4589.0674
6.001458E-17
Print
Redraw
SPACE TELESCOPE SCIENCE INSTITUTE
Operated for NASA by AURA
Grid off
Auto
Plot type
Expand
Measure
Line IDs
Units
1.0e-14
1.0e-15
Flux density (ERGS/CM^2/S/A)
3000.0
5000.0
Wavelength (ANGSTROMS)
Pan

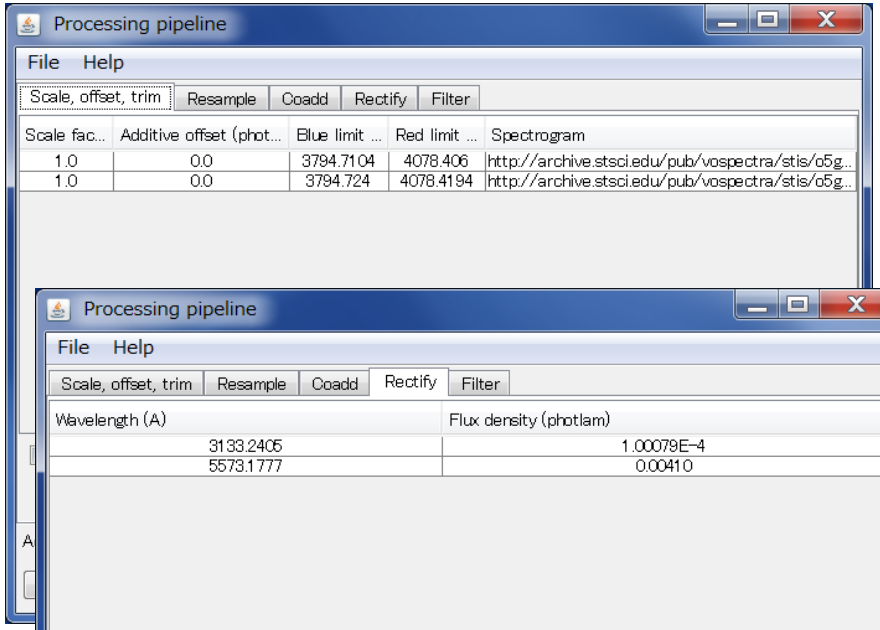
データの足し合わせ

1. Coplotボタンでファイル一覧を開き、足すファイルを選択して、Processボタンを押し、Processing pipeline を起動。

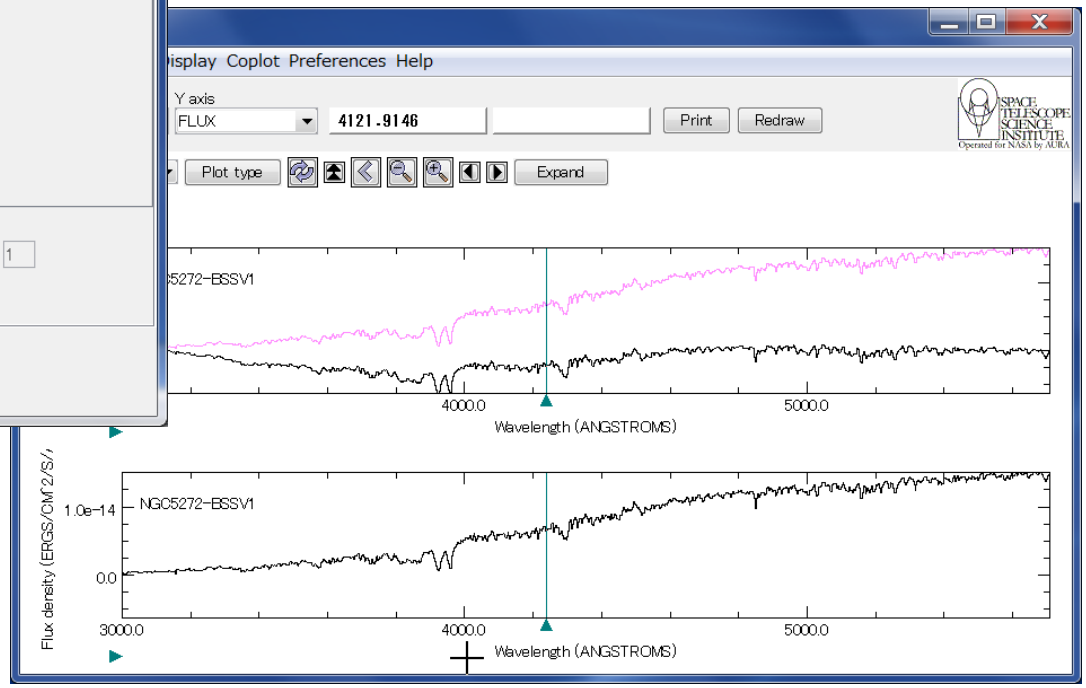


2. Coaddタブに移り、Execute this step にチェックを入れ、Executeで実行。

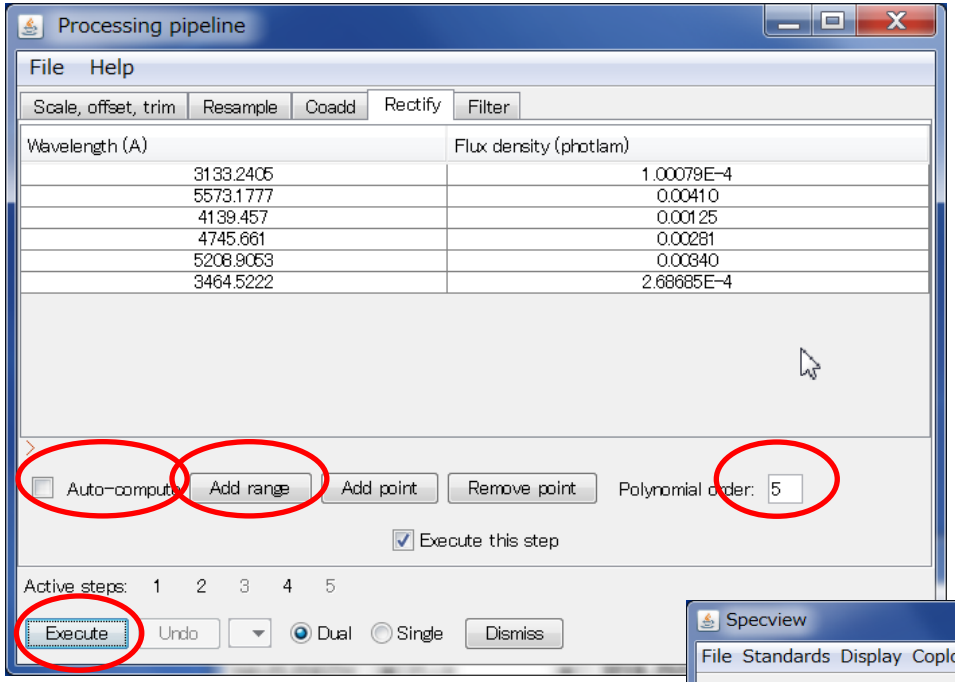
ベースライン除去



1. 同様に、Processing pipeline を起動。Rectify タブに移動。
2. Execute this step をチェック
3. ベースラインは多項式で作成される。Default では一次関数。（両端5%ずつを結ぶ）
4. Execute ボタンで実行



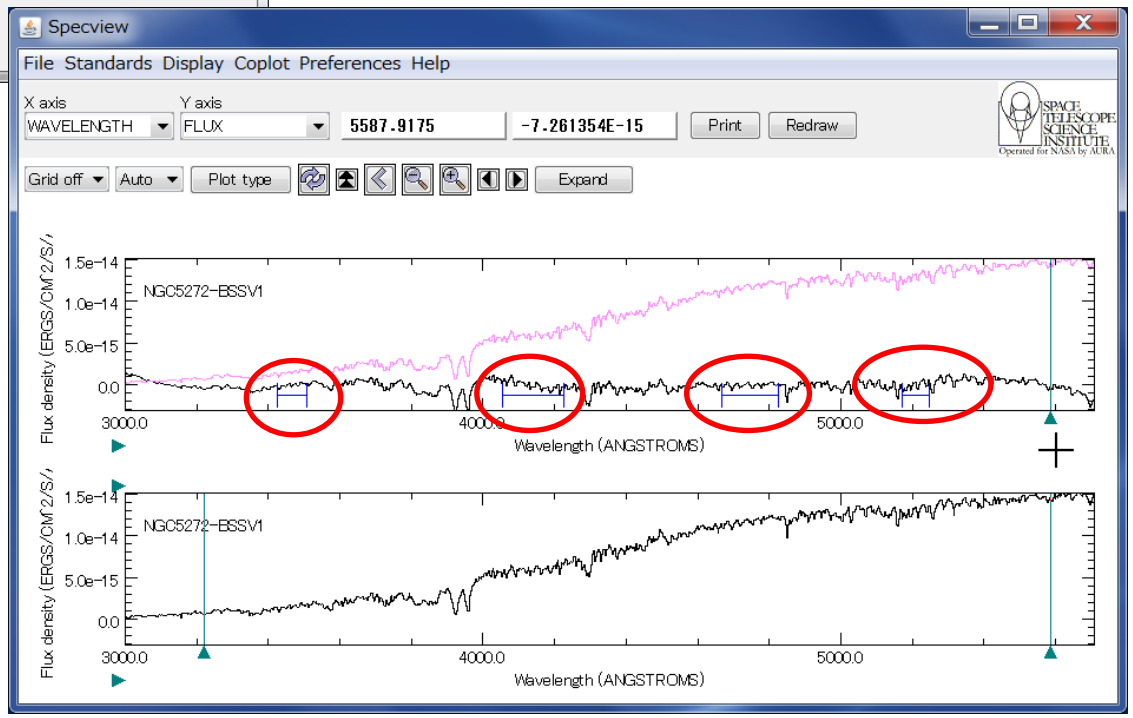
元データがピンク、
結果が黒の線で表示される。



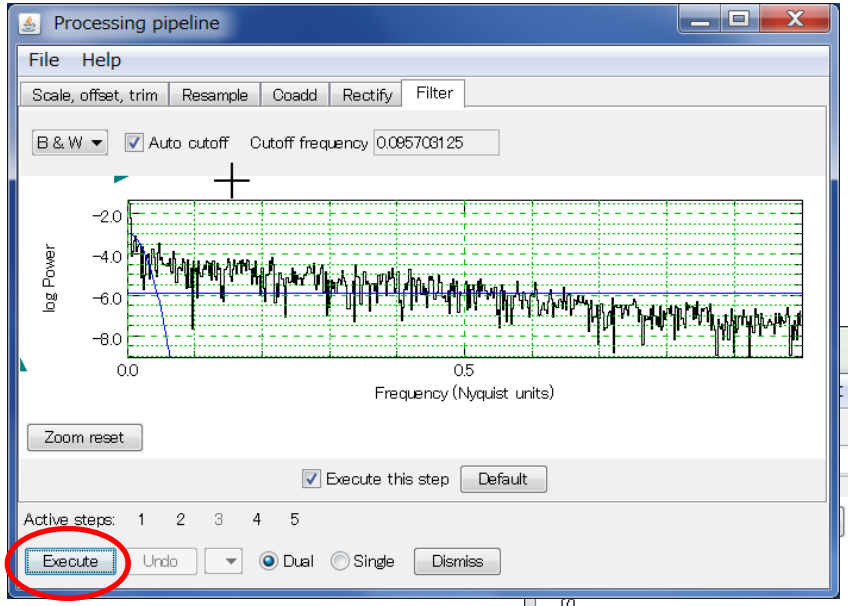
n次の多項式を使いたいときは、fitに使う値を計n+1箇所以上指定する。

Auto-compute のチェックを外し、「Add range」画面上で範囲の上限・下限を指定していく。

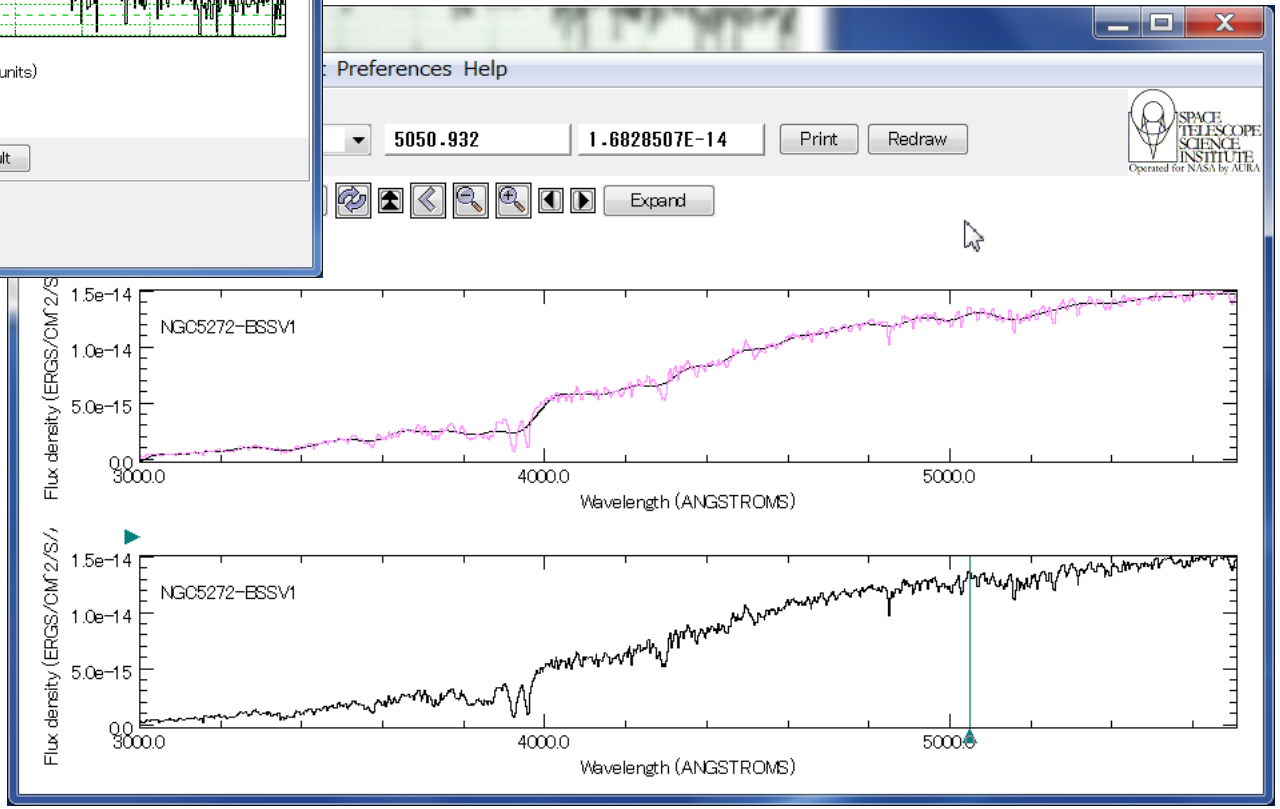
各範囲の平均を結ぶ多項式がベースラインになる。



ノイズ除去（フーリエフィルター）

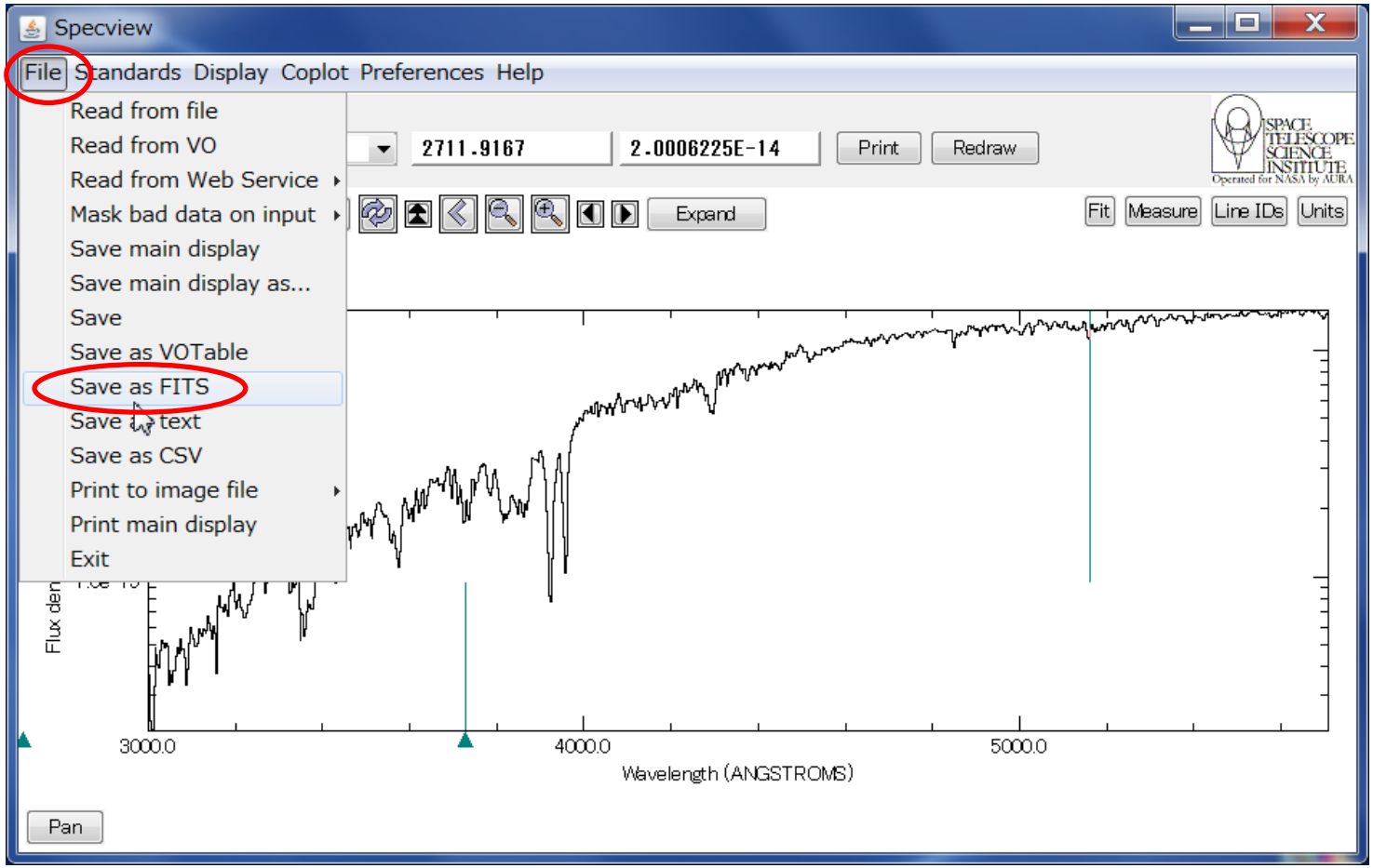


0. 事前にRectifyも行っておくことが望ましい。
1. Rectifyと同様に、Processing pipeline を起動。Filter タブに移動。
2. Execute



Brault & White filter　or
Box filter
Cut-off 周波数は、指定できる。

保存


Specview
File
Standards
Display
Coplot
Preferences
Help
Read from file
Read from VO
Read from Web Service
Mask bad data on input
Save main display
Save main display as...
Save
Save as VOTable
Save as FITS
Save as text
Save as CSV
Print to image file
Print main display
Exit
2711.9167
2.0006225E-14
Print
Redraw
Expand
Fit
Measure
Line IDs
Units
3000.0
4000.0
5000.0
Wavelength (ANGSTROMS)
Pan